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THE

# JOURNAL

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OF

# GAS LIGHTING,

## WATER SUPPLY,

AND

## SANITARY IMPROVEMENT.

VOL. XXXIII.

January to June, 1879.

LONDON:

WALTER KING,

(FOR THE EXECUTORS OF THE LATE WILLIAM B. KING,)

11, BOLT COURT, FLEET STREET, E.C.

THE

# JOURNAL OF GAS LIGHTING,

## WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

Vol. XXXIII. No. 817.] LONDON, JANUARY 7, 1879. [31st Year.] Price 6d.

**GAS PURIFICATION**
BY
**OXIDE OF IRON.**

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CENTRAL DEPÔTS:
CO. DONEGAL, IRELAND;
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OFFICES:
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The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
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AND MANUFACTURER OF
**WOOD GRIDS**
FOR
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WET AND DRY GAS-METERS,
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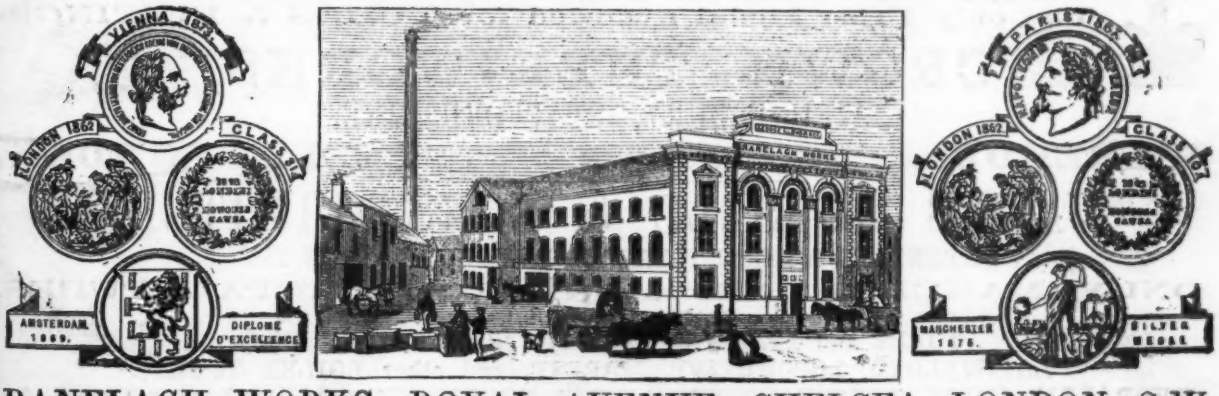
DRY GAS-METER MANUFACTURERS,
**HAVE REMOVED TO MORE EXTENSIVE PREMISES:**




RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

SILVER MEDAL, PARIS EXHIBITION, 1867.

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**COOMBS WOOD TUBE-WORKS, HALESOWEN,**

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**WROUGHT-IRON TUBES AND FITTINGS,**

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UP TO FOUR FEET IN DIAMETER.

**London Offices: No. 4, Cloak Lane, Queen Street, E.C.**

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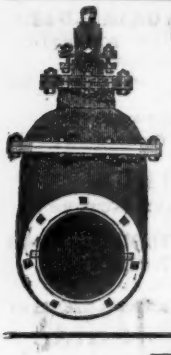
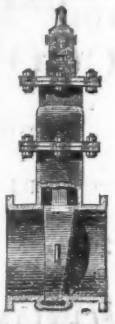


## C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

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# FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

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AND GAS APPARATUS OF EVERY DESCRIPTION.

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By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

**ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.**

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Will be glad to supply the above on the most favourable terms, and to treat, by Purchase or Exchange, for Spent Oxide.

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**ALSO PATENT DRY COPPERAS FOR EXTRACTING AMMONIA.**

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THE

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## [KIRKHAM, HULETT, AND CHANDLER'S PATENT.]

Some of the advantages claimed for this Apparatus are as follow:—

**The Exposing of a large Amount of Effectually-wetted Surface (which is continually reproduced) to act upon the Gas.**
**Unerring Regularity in the Distribution of the Liquor.**
**Saving of Expense in Providing and Exchanging Scrubbing Material—none being required.**
**Economy of Space, thus enabling the Apparatus to be protected from the Weather.**
**Economy of First Cost and of Maintenance.**
**It works without Pressure.**
**It is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured.**

*Applications for Prices, &c., to be made to*

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**ECONOMY IN THE PRODUCTION OF GAS.**

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FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out* OF ACTION.

A Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,
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**Near BARNSLEY.**

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

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IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.

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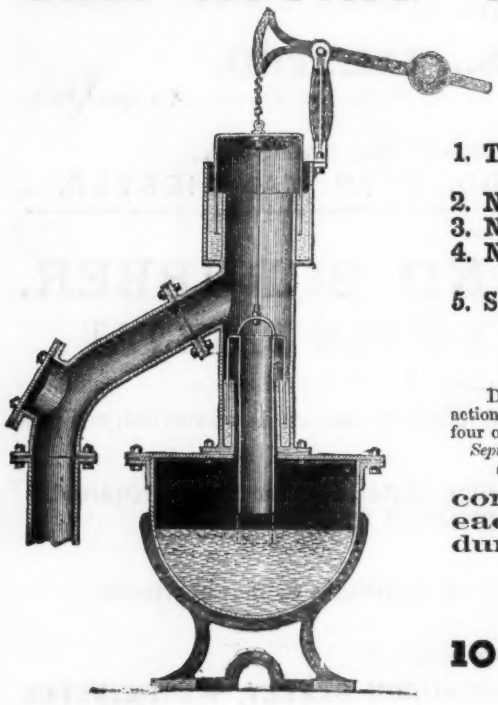
# SELF-ACTING REMOVABLE DIP-PIPE,



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## CHANDLER & STEVENSON.

ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
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9. Is perfectly automatic in its action.

Testimonial from the Proprietor of the Apeldorn Gas-Works.

DEAR SIR,—In reply to your inquiry, the Self-Acting Dip-Pipes, which have been in action at my works for two years, give entire satisfaction. I forward you order for four others.

Yours truly,

*Sept.* 9, 1877. R. BAKKER.

**These Dip-Pipes can now be supplied complete, except the flanched bend, for £4 each, which includes the charge for licence during the whole term of the patent.**

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**Who fix the Dip-Pipes, at a small Charge, when required.**

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**ROUND STATION-METERS,**

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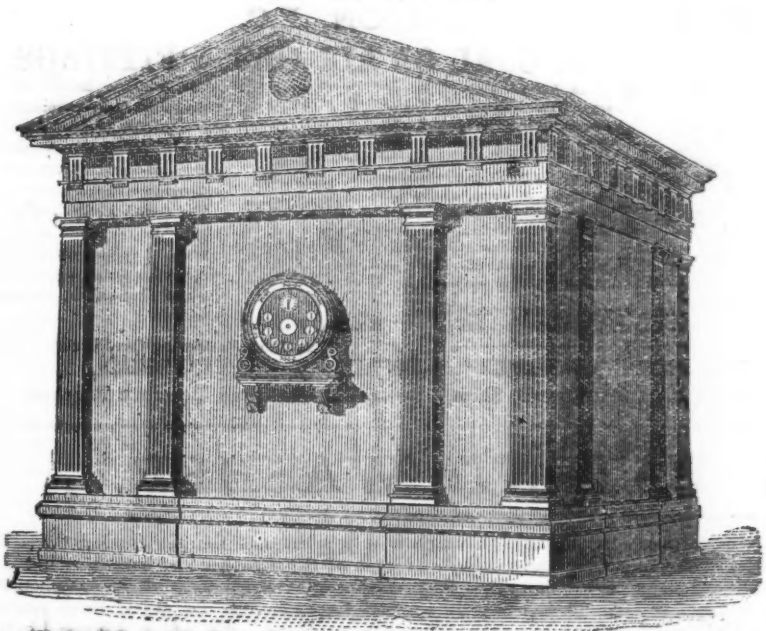

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GAS COOKING APPARATUS.

**Home and Foreign Orders promptly attended to.**

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**WOOD PURIFIER SIEVES,**

**Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.**

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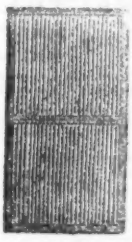

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WITH TAPER BARS,

**MADE BY MACHINERY**

CAPABLE OF MAKING 10,000 FEET WEEKLY.

***References to Hundreds of First-Class Engineers.***

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Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

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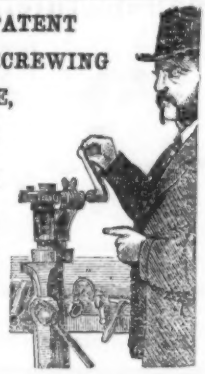
**GRIRDROD'S PATENT**

**PORTABLE PIPE SCREWING**

**MACHINE,**



For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

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**Gold Medal Awarded, Paris Exhibition, 1878.**

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ANVILS, VICES,

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The Silber Tubulated Gas-Burner.

The *World* says: "The light given by these Burners, besides being abundant in quantity, is almost like sunlight in its quality, so that it produces the same spectrum when refracted through a prism, and allows even the most delicate shades of colour to be distinguished."

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The *London Medical Record* says: "This uniform blending of the air with each part of the flame results in rendering it pure and white, and very considerably lessens the blue colour, which is significant of waste, and which is very plainly visible at the base of all imperfect lights. The creation and the maintenance of this white light—not yellow light—is a proof of perfect combustion.

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The *Sanitary Record* says "Mr. Silber's improvements render it possible to eliminate, as far as is practicable, the sulphuric acid due to the incomplete combustion of impure gas."

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This apparatus effects the most intimate contact between the liquor with which it is supplied and the gas passing through it, resulting in the complete removal of all particles of tar, increasing the ammonia strength of the scrubber and condenser liquor, and removing a large proportion of other impurities—notably, carbonic acid. The Washer is intended to work in conjunction with a scrubber. It occupies little space, and is inexpensive. It has been in successful constant use for nearly three years, does not become clogged with tar or corroded by the action of the liquor or gases, it gives three inches of pressure, and only needs a supply of liquor to keep it in regular action without any further attention.

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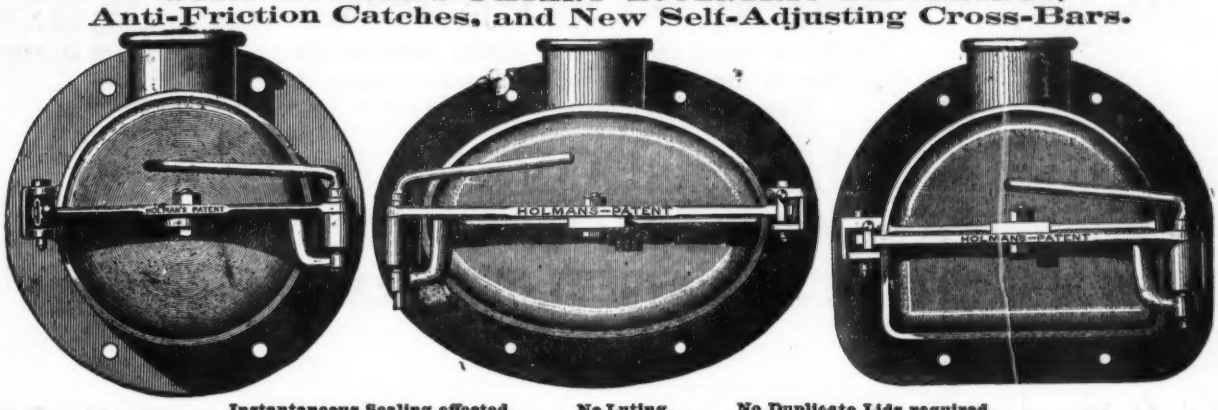
## SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

**WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,**

**Anti-Friction Catches, and New Self-Adjusting Cross-Bars.**




**Instantaneous Sealing effected. No Luting. No Duplicate Lids required.**

**Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.**

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

**T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.**

**D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—**

**The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.**
**And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland**

## HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

**These Governors have been adopted by many leading Gas Companies, among whom are the following:—**

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

### TESTIMONIAL.

*The Gaslight and Coke Company,*
*9, Water Street, New Bridge Street,*
*Blackfriars, E.C., Feb. 27, 1875.*

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

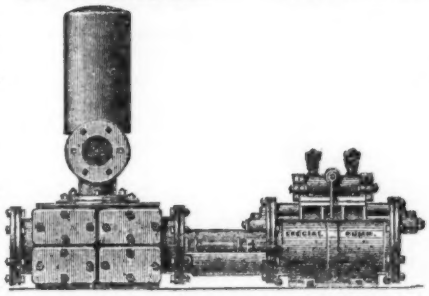
Yours truly,

(Signed) JOHN JOHNSON.

**PRICES AND FULL PARTICULARS ON APPLICATION.**

## THE "SPECIAL" STEAM-PUMP.

| Diameter of Steam Cylinder. | Diameter of Water Cylinder. | Length of Stroke. | Gallons of Water per Hour, Approximate. | Reduced Prices. |
|---|---|---|---|---|
| 3 | 1½ | 9 | 450 | £16 |
| 4 | 2 | 9 | 815 | 18 |
| 5* | 2½ | 12 | 1,250* | 20 |
| 5* | 3 | 12 | 1,830* | 22 10 |
| 4 | 4 | 12 | 3,250 | 25 |
| 6* | 4 | 12 | 3,250* | 30 |
| 5 | 5 | 12 | 5,070 | 32 10 |
| 7* | 5 | 12 | 5,070* | 40 |
| 6 | 6 | 12 | 7,330 | 40 |
| 8* | 6 | 12 | 7,330* | 50 |
| 7 | 7 | 12 | 9,750 | 50 |
| 10* | 7 | 12 | 9,750* | 65 |



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

**TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS; HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.**

*FULL PARTICULARS, ESTIMATES, CATALOGUES, ETC., ON APPLICATION.*

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

**PATENT DRY GAS-METERS,**

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

# THOMAS GLOVER & CO.,

## DRY GAS-METER MANUFACTURERS,

## 214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

## LONDON, E.C.

### THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

# WILLIAM PARKINSON & CO.

(ESTABLISHED 1816)

ARE THE ONLY MAKERS

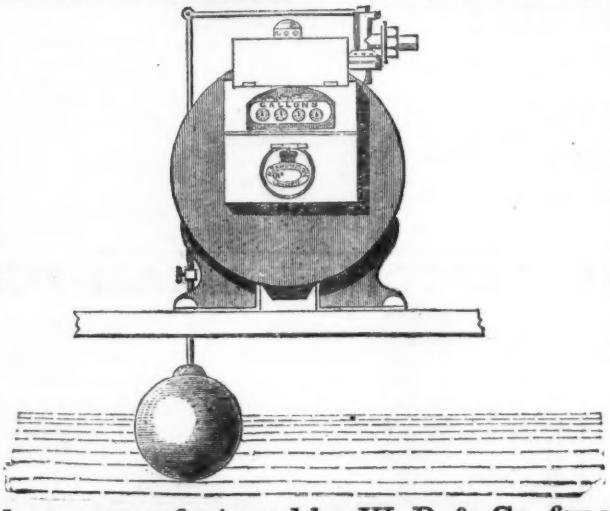
OF THE

# LOW-PRESSURE WATER-METER.

These Meters will register with perfect accuracy, either at full speed, or with a few drops only passing through them.

They must be placed over the cistern to be supplied, and the water, after being measured, will fall from the outlet into the cistern below. Each Meter is fitted with a ball-valve, so made that it can be adjusted to shut off the supply at the inlet when the water reaches any required height in the cistern.

The 100-gallon Meter is fitted with a cistern holding about three or four gallons, and may be fixed inside a house, free from the effects of frost, and requires no attention after once being fixed.



From "The Engineer," April 6, 1877.

"Low-pressure Meters have been found to register with almost perfect accuracy, or, at all events, within 5 per cent. either for or against the consumer, and from the nature of their construction are by no means easily deranged. Still, even the low-pressure meters have their disadvantages, but these are chiefly as respects the question of first cost, seeing that they must have a cistern fixed at a higher level than that at which the supply is needed. All things considered, however, the balance of opinion rules at present in favour of the low-pressure Meter and they are consequently increasing in favour as time goes on.'

**These Meters have been manufactured by W. P. & Co for more than 25 years, and are largely used by the following and other Water Companies:—**

NOTTINGHAM, DERBY, LEICESTER, SUNDERLAND, GREAT YARMOUTH, SHEFFIELD, NORWICH, LOWESTOFT, COVENTRY, SOUTHEND.

## COTTAGE LANE, CITY ROAD, LONDON, E.C.

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## TO CORRESPONDENTS.

*No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.*


# THE JOURNAL OF GAS LIGHTING,

## WATER SUPPLY, & SANITARY IMPROVEMENT.

*TUESDAY, JANUARY 7, 1879.*


## Circular to Gas Companies.

THE year which has just passed away will be memorable, in the annals of artificial illumination, as that which saw the introduction into England of the electric light in its present state of development. The light had long been known, and had received applications in which it was reported to have been very successful. It was, however, for the most part, mainly a scientific toy. The electric force being generated by moist batteries, and no effective regulator having been discovered, the light was found to be extremely expensive and irregular. Liebig, in an exhaustive paper, showed that, in point of economy, the light could never compete with the other known modes of illumination, and this, it must be remembered, was before petroleum oil was discovered. We think we may safely claim for Englishmen the honour of having contributed more than any others to bringing the electric light into its present state of development, by the use of dynamo-electric machines. The names of Holmes and Wilde are known all over the world, and we think we may claim the most recent improver of electric machines in the person of Dr. C. W. Siemens, whom we regard as at least half an Englishman. Thus we may fairly say that, in spite of very ingenious Russians, Poles, and Frenchmen, England has fairly done her share of the work of promoting illumination by electricity. It is true that no one in this country has devised a special candle. MM. Jablochkoff, Rapieff, Lontin, and Werdermann share the honours of that invention. Nevertheless, English engineers may fairly divide with foreign competitors the credit of bringing the electric light into its present condition.

We know very well what has happened since the early displays of the electric light. An extraordinary scare—got up mainly, we believe, by speculators—sent down the value of gas shares to a price which they had not touched for many years. The dodge, however, was not very successful. Holders did not part with their property so easily as those who tried to dupe them imagined they would, and gas shares are now rapidly returning to the value they had about twelve months ago. Our columns have shown that English engineers, and, in fact, every one who has investigated the matter for himself, have never had their faith shaken in the stability of a gas investment. We have published numberless reports on what we may call "Electricity "*versus* Gas," and we wait for two more, which, as to the relative cost of the two illuminants, will, we hope, be conclusive. The exhibitions now being made on the Thames Embankment and the Holborn Viaduct, will, we trust, afford the two eminent Engineers, who are superintending them, the opportunity of deciding which is the cheaper and more effective mode of illumination—that by means of gas, or that by electricity. Let us be clearly understood. We mean, public illumination. We have no fear of the invasion of electricity into our houses for a quarter of a century to come, whatever Mr. Edison, the man of multitudinous patents, and his rather numerous co-inventors on this side the Atlantic, may attempt to secure for their own profit. We question whether the use of gas will not go on increasing in just about the same ratio as before, in most of the prosperous towns in England. It might have been thought that the introduction of American petroleum would have had considerable influence in lessening the consumption of gas. Nothing of the kind, however, was felt. The consumption of gas went on increasing just as before petroleum came to this country, and no doubt it will continue to do so. It has doubled in London since 1869, and, at the present rate of increase, will probably do so again in the next decade. Shareholders may thus confidently look forward for future prosperity, and, in all cases in which the sliding scale of price and dividend is adopted, will probably be able shortly to obtain something more than the old statutory rate of ten per cent.

Beyond the advent of the electric light, we have nothing to chronicle in the way of striking inventions. Continued progress is made in manufacturing details, but nothing of importance was brought out during the past year. Mr. Sugg has produced a new burner of large illuminating power, which will soon be exhibited on the Thames Embankment, and will, unless we are mistaken, rival, if not eclipse, the electric light.

A novelty in the use of electricity for the production of a moveable light has been brought out by Messrs. Ransomes, Sims, and Head. They place a dynamo machine on a small engine, and cause it to rotate, while the locomotive is in motion, by means of a strap from the fly-wheel; and when the engine is stopped, the driving-wheels are thrown out of gear, while the machine is kept in movement. The object of the invention is to light up tunnels and works where repairs are proceeding.

There seems to be a prospect that an amicable arrangement will be come to between the Corporation of Birmingham and the Authorities of King's Norton, so that it will be unnecessary to proceed with the Bill promoted by the latter, to remove the objectionable charge for gas supplied to the township, of one shilling per thousand feet beyond that paid in the borough. We hope the report is true, for the introduction of the measure to Parliament would naturally give rise to an angry contest, the issue of which would be doubtful.

A writer, signing himself "A Gas Shareholder," who has the best means of knowing the value of gas property, and is, further, well able to judge of the prospects of gas enterprise, sends us a letter intended to reassure the holders of gas shares. The course which has been taken by the leading journal, in doing its utmost to depreciate the value of gas, is extraordinary. *The Times* are perfectly free to have their own electric light, and, if they find it useful, to continue its employment; but they should not admit correspondence into their columns, written with the obvious design of running down gas, and refuse to insert replies to misleading statements. Few, perhaps, are aware of the importance of the gas industry in this kingdom. The money invested in the property is counted by many millions, and the shareholders number very many thousands. Among these are a large number who would suffer extreme penury if gas were superseded. We have, however, not the slightest fear for them. *The Times* may continue to publish letters, but the Gas Companies will flourish all the same.

The poll of the ratepayers of Exeter has resulted in what every one might have expected—the complete defeat of the Town Council. The latter were unanimous in recommending the inhabitants to unite with them in a scheme for effecting the purchase of the undertaking of the Exeter Gas Company. All the circumstances connected with the transaction have been detailed in our columns, and we need not here refer to them at any length. There are evidently two opinions in Exeter; the one being that the possession of the gas-works, even if acquired at the price which the Council had agreed to pay, would be extremely advantageous to the city, inasmuch as it might give them the opportunity of supplying gas at a low price, and, at the same time, afford the means of making a profit to supplement rates. On the other hand, there seems to be a prevalent opinion that the price which the Corporation had agreed to pay was much too high. Such a case as this often happens, and we are not surprised at it, as ordinary tradespeople do not understand buying profits, statutory or other, which they consider illusory. At the present moment there is a disturbing influence, and, although it does not seem to have affected the ratepayers of Exeter very much, it must be mentioned. The electric light has disturbed the value of all gas property. Naturally, in localities remote from central influences, these disturbances are less keenly felt. Our City share lists show that gas property is gradually rising to the value it had before the "scare," as it has been called. But to return to Exeter; the Town Council may, if they choose, proceed with their Bill, notwithstanding the opposition of the townspeople; but they will do it at a risk. The position of the Company is somewhat awkward. Their works, as they stand, require extensive remodelling; but it is admitted, on all hands, that a new site, somewhat remote from the situation of the present works, is highly desirable, and this, we believe, the Company have secured. It is not for us to indicate the course which the Gas Company should pursue, or the Town Council follow. Our readers know very well that we always advocate the retention of commercial undertakings in the hands of commercial men. There may be special circumstances at Exeter which might make the Gas Company there desirous of parting with their works at a good price; but with this, as we have said above, we can in no wise interfere. We shall watch with much interest the proceedings of the Company and the Town Council, under circumstances which, so far as we remember, are without precedent.

The Corporation of Hereford have adopted a very sensible course, and have, by an overwhelming majority, decided to rescind the resolution they passed to postpone the continuation of the erection of their new gas-works for three months. The idea was so absurd that we felt a difficulty in understanding how sensible members of the Town Council could possibly fall in with the suggestion. If they really feared the electric light, their proper course would have been to have put off the erection of new works *sine die*, and waited patiently for the publication of the electrical marvels which Mr. Edison promises, at some period or other, to reveal. But, in the meantime, Hereford must be lighted. The city and neighbourhood have wants which grow day by day; and, as matters stand at present, how can effective illumination be supplied except by means of gas? It is almost incredible that the Council should have hesitated for a moment. If additional railway communications were proposed, and it was suggested that balloons might presently supersede railroads, how would the Town Council have acted? The one idea is not more absurd than the other. The development of the electric light into a useful domestic illuminant, and the adaptation of balloons for regular locomotion, will, in our opinion, be about contemporaneous.

Mr. W. Livesey kindly writes to place before Gas Directors and Managers his view of the effect—or, rather, non-effect—which the Weights and Measures Act of last Session will have on the mode of selling coke. It is satisfactory to learn, upon such authority, that no interference with the present manner of selling this residual will be made, provided a standard measure of capacity be employed.

Dr. Williamson, the Chief Gas Examiner for the Metropolis, publishes his quarterly report with his usual punctuality. It calls for no remark, except the stereotyped one, that it shows the Gas Companies under his supervision carefully fulfil their duties to the public. There is just one thing we may call attention to, for the information of our friends in St. Pancras, and that is, that the average quality of the gas examined in Camden Street during the past quarter was 16·6 candles.

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Reduction in the Price of Gas at Briton Ferry.—At a meeting of the Briton Ferry Local Board, last Thursday, it was resolved to reduce the price of gas 6d. per 1000 feet. The prices will now be 4s., 4s. 6d., and 5s.

## Water and Sanitary Notes.

The New River Company are now making a grand experiment, in attempting to tap the lower greensand in the neighbourhood of Cheshunt, Herts. The distribution of the greensand for some distance around London is extremely irregular. It is sometimes above and sometimes below rocks which are considered to be of older date. This has caused a good deal of mystification, and our most eminent geologists are puzzled to settle the arrangements of the strata which succeed the chalk in the London basin. At the present time, the Company's boring has reached a depth of 900 feet, and is now in the gault. What will follow remains to be seen. We hope the New River Company will, in the exercise of that wise liberality which they have always practised, persevere in their efforts to reach what, if successful, must prove a most valuable addition to their present means of supply. There is, as usual, another question mixed up with this, and it is, whether water or coal will be first reached. There are people who are always wishing for the discovery of coal at workable depths in the immediate vicinity of the Metropolis. For our own part, we have no desire whatever to see grimy coal mines scattered about our beautiful suburbs. If our children's children should suffer from a want of coal, then it will be time to explore the depths which lie under our feet. At present, our most pressing want is pure water, and if this be found, we shall be perfectly content. Meanwhile, it must not be supposed that we are insensible to the value and interest of scientific investigations, and if the New River Company strike coal in the course of their explorations, we shall be very glad to hear of it. At the same time, we hope it will be allowed to rest where it is for a century or two, or until it is wanted.

A brilliant idea has been started in America, and that is nothing less than to warm entire cities by the distribution of steam, superheated or not, into the houses. So far as we can gather from the reports of the newspapers, the idea is ridiculed in all scientific circles, and the scheme is regarded in America as simply the offspring of a "ring," and "born," "made," "formed," and "fashioned" for the purpose of plunder. We shall probably never hear of it in this country, so it is quite unnecessary to expose the difficulties which lie in the way of the distribution of steam over large areas. Another idea which crops up at the same time, is the furnishing of heating gas; by which, we presume, is meant "water gas"—a project which has more than once been brought forward in this country, but has always been met by almost universal condemnation. The poisonous nature of carbonic oxide is an insuperable objection to its introduction into houses, where an escape might prove fatal to most of the inhabitants.

---

Maidstone Water-Works Company.—A special general meeting of the Shareholders of this Company was held on Monday, the 30th ult., for the purpose of considering the draft Provisional Order, which has been presented to the Board of Trade, under the Gas and Water Works Facilities Act, 1870, whereby it is sought to empower the Company to raise additional capital when required. The Mayor (Mr. C. Ellis) presided, and, the Order having been submitted for the consideration of the meeting, moved that it be approved. The motion, which was seconded by Mr. A. N. Pryor, was carried unanimously.

The Proposed Purchase of the Strood Water-Works by the Rochester Corporation.—On Friday, the 27th ult., a special meeting of the Shareholders in the Strood Water-Works Company was held—Mr. Bulmer in the chair—for the purpose of considering the proposal of the Corporation of Rochester to purchase the works, under the provisions of the Bill introduced by them into the present session of Parliament. The Chairman having explained the object of the meeting, and the resolution adopted at a previous meeting empowering the Directors to treat with the Corporation, the Secretary (Mr. Ruck) read the Memorandum of Agreement, signed by the Chairman and the Town-Clerk, authorizing the sale of the works to the Corporation at a price to be agreed upon, or, failing agreement, then by two Arbitrators or their Umpire. The meeting unanimously agreed to the agreement for the sale of the works.

The Transmission of Electric Power.—If there be a loss of 4 to 8 per cent. in the transmission of gas, and of from 30 to 60 per cent. in the transmission of water, the question of the loss in the transmission of electric power is not yet by any means settled. For low currents of electricity, the isolation attained by wires hung in the air is so satisfactory, that one eminent writer on telegraphy has declared that the simple contact, made in the mouth of the operator, of a silver sixpence, with a plate of zinc of equal size, will deflect a delicate galvanometer at a distance of 500 miles on a circuit. This is, no doubt, incredible, if true; but it is the statement of a competent man. For the transmission, however, of any current which has a dynamo-electric value, the case is different. The general rule is, that the resistance is directly as the length of the current, and inversely as the section of the conductor. Thus, for an increased length of circuit, an increased weight of wire is requisite. But that is not all. There is no doubt that something occurs in the transmission of the electric current akin to leakage in the transmission of gas or water through pipes. It would also appear that this leakage, or resistance, may be represented as a function of the intensity of the current. All that we can say, from the latest communications we have had with the leaders of the movement, is, that no mathematical expression for this loss has as yet been ever suggested. One gentleman, who has attained extraordinary success in manipulating electric power, states that the difference in rate of loss is so great as to impose a very narrow limit on the length of a circuit that can be practically available, whether for the production of light, or for any other dynamo-electric purposes.—*Builder.*

## SANITATION.

A REVISED edition of certain official "Suggestions" as to the sewerage, drainage, and water supply of towns, has just been issued by the Local Government Board. The document is drawn up by Mr. Robert Rawlinson, C.B., the Board's Chief Engineering Inspector, and is intended as a guide to Local Authorities in the preparation of plans to be submitted when loans are required for the execution of public works. The publication is also intended to serve generally as a source of information respecting the most approved principles in sanitary engineering. The dulness of official precision is relieved at the outset by some historical references, showing that, although there are examples of sewering and draining in remote ages, as among the cities of India, China, and Italy, yet, even in the ripest period of Greek and Roman civilization, the cities which presented the very finest specimens of architecture were only partially sewered. The Cloaca Maxima of Rome appears to have been "more of a valley-line culvert than a useful main sewer." Rome and other Italian cities were sewered, and some of the public buildings were drained; but there is no evidence that entire sites, including streets and houses, were at any period—Roman or pre-Roman—fully and completely sewered. Bricks and pottery are found in abundance among the ruins of ancient cities, but nothing to prove that any one of these places was sewered and drained in that completeness of manner which is now common to English towns. In mediæval times, the cities and towns of Europe knew little of sewers and drains. House draining and town sewering, therefore, claim to be modern arts, and it may be added, that as yet they lack completeness in their application. In some localities where there are sewers, the houses are not provided with proper drains. Perhaps the drains have no connection with the sewers, or the connection is made in such a way that the house is rather the worse for it than otherwise. There is also a vast amount of "small property" in existence, so miserably situated or badly constructed, and perhaps so cruelly overcrowded, that sewers and drains afford only a very partial remedy for their defects. Sanitary principles have to be observed at every step, including all within and about the house, as well as in respect to the execution of public works. To make everything clean, sweet, pure, and wholesome is a mighty enterprise, which modern civilization has only just begun to undertake. It will cost enormous sums of money to accomplish all this; but the fruits are precious enough to give us recompense for all the needful outlay.

We have already mentioned that modern engineering looks upon ancient sewerage as something of a sham. But even the giant sewers of modern London cannot be held altogether free from the taint of delusiveness. Thus we are told that in some towns—"London, for instance"—a per centage of house drains have no connection with the sewers, and "most of the drains" are of defective material, while the design and workmanship are said to be "worse than the materials." We trust this state of affairs does not occur extensively in London, though we fear that some of the poorer neighbourhoods may be thus circumstanced, and it is certain that in particular cases the dwellings of the higher classes have been found miserably defective in the matter of drainage. Public buildings connected with the State have proved to be scandalously unhealthy, and even royal residences have had to undergo a thorough overhaul. Great engineering works are little more than a broad foundation, on which a mass of detail has to be built up. It is rightly said that to sewer a town, and then to leave house-drains to hap-hazard construction, is simply little better than to waste the ratepayers money. The proper junction of house-drains with sewers should be "imperative"—that is to say, compulsory; and house-drains should always be executed in accordance with a sanctioned plan, the Local Authority insisting, as far as practicable, upon every house-drain being designed, constructed, and carried to the main sewers under the supervision of their Surveyor. The conditions of health in the construction of a dwelling, it is observed, "will not be accomplished "by builders working under no responsibility." One critical feature in the affair is this—that the house requires to be connected with the sewer so far as liquids are concerned, but practically disconnected in respect to the sewer gases. Thus we are told—"No house-drain should ever be joined to a sewer direct, "so as to form a continuous flue by which gases may flow into "the house." The fact is that sewers and drains are edged tools, capable of doing good or harm, according to the way in which they are handled. When a builder constructs a house so that it serves as a ventilating chamber to the town sewer, or when he so manages matters that the house drain empties itself into the subsoil, he is simply acting as next friend to the undertaker.

The Sanitary Engineer is warned that if he attempts to apportion sewers so that they shall be of sufficient capacity to receive and remove the flood water, he will commit a serious and costly blunder, as heavy falls of rain cannot be dealt with in that way, but must pass over the surface as before, or else be carried off by special drains provided for the purpose. It is admitted that in large towns there may be exceptions, in which "flood water over-"flow-channels into natural streams may have to be formed." An important rule is laid down with regard to the treatment of natural watercourses, thus:—"Natural streams should not be "arched over to form main sewers;" the reason given being that "a natural stream may drain a district very much larger "than the area built over, and consequently a culvert (or sewer) "of capacity to remove flood waters in a wet season would be "comparatively dry during a dry season, and any sewage then "flowing in would stagnate and evaporate, causing nuisance." A further reason given is, that within some town-areas there are sites, especially on the margins of rivers and streams, which are liable to be flooded during heavy rains; and, if such sites are occupied by buildings, these may be occasionally injured. We may add that, when property not previously subjected to floods is visited with an inundation, a serious permanent loss is incurred, the property being at once depreciated in the market. Respectable tenants move elsewhere, and poorer tenants take their place, paying lower rents. It is observed that it may be the duty of a Sanitary Authority to decline to sanction plans of buildings, if such are proposed to be placed on sites which cannot be drained, especially if it is intended to excavate cellars. For the more ready removal of surface water and extreme falls of rain, it is remarked that valley lines, natural streams, and surface-areas may be improved—that is to say, streams filled up by accumulation of refuse may be cleansed and deepened, and areas liable to be flooded may be raised, or be protected by embankments. In some districts, steam or some other power may be required for pumping sewage and ordinary flood waters; but this pumping power can only be of some moderate capacity; and as there may be, on occasions, extreme floods, liable to injure property, "it will be the duty of "the Sanitary Authority to provide, by anticipation, so far as "may be practicable, against such flooding and injury." The growth of towns, and the extension of sewerage, coupled with the development of land drainage in the open country, are causes which tend to the production of floods in urban districts. London itself affords some serious examples of this nature; and it seems likely that we shall hear much on this topic, both in the Metropolis and the provinces. At the present time, the flourishing borough of Hastings has in its very centre, and in the immediate vicinity of some of its best property, a district which is subject to land floods of a very hurtful character. The house property immediately concerned may not be of a very valuable kind, but the "occasional" floods, coming at very uncertain periods, are a nuisance and an eyesore, reflecting some degree of discredit on the borough, and possibly imperilling the public health.

It seems to be a sound principle that a house should not be built unless it can be properly drained. If there is a natural difficulty, such as the lowness of the level, which renders the draining of the house impracticable, its erection ought not to be sanctioned. A house liable to be flooded is in much the same predicament as one which cannot be effectually drained. But it often happens that, in attempting to provide sewerage for a district, the liability to flooding is increased. The skill of the Engineer, aided by a judicious application of public funds, is requisite to prevent or remedy the misery of town floods. In the case of a fashionable watering-place, such as Hastings, a clean bill of health is indispensable, and for this reason the intrusion of flood waters into any considerable number of its dwellings ought, by all possible means, to be avoided, for the sickness thus generated will be liable to make itself known. A large extent of damp subsoil also affects the very climate of a neighbourhood. As towns extend themselves, the Sanitary Authorities should, in all cases, exercise a keen foresight with regard to building operations on low levels, and great respect should be paid to the existing watercourses. These cannot always be covered in or their waters diverted into the sewers, without creating a risk that heavy rains will produce floods, with all their miserable consequences. The question is a difficult one, involving the rights of property on the one hand, and the burdens of the ratepayers on the other. A man may claim to build on his own land, and when the rains descend, the ratepayers may plead that they ought not to be taxed to intercept the floods. A question of this sort arises with respect to the overflowing of the Thames in London. It is sometimes difficult to hit upon the exact border-line between private interests and public duties—that is to say, to determine how far the public rates should come to the aid of private property. On the other hand, it will occasionally appear that private interests are made

to suffer by the execution of works designed to benefit the mass. It would seem that an evil so created may properly be remedied at the public cost.

The document issued by the Local Government Board contains an interesting statement with regard to the disposal of sewage. In October last there were about eighty-seven towns, districts, parishes, and places where sewage was being disposed of by irrigation, and twenty-three which employed precipitation, treatment by chemicals, and partial land filtration. In twenty-four other instances, sewage was being disposed of by ruder and more imperfect modes of filtration—as through charcoal, wicker-work, and straw. In sixteen localities, mere mechanical subsidence was the method employed. It is observed that there are towns, both on the sea-shore and on tidal estuaries, which do not escape causing a nuisance by discharging crude sewage improperly, the outlets being too near roads, houses, or bathing-places. The remedy is said to be, either to pump the sewage inland for irrigation, or to extend the outlets so that the flow of sewage shall not be returned on to the shore; or else to precipitate the solids, and disinfect the sewage. The cost of any of the processes must, in all cases, be considered as an expenditure of money for cleansing the town. In the adoption of irrigation, the areas which have been found to answer in practice are stated to be as follows:—For broad irrigation, about one statute acre for each one hundred of the population of a fully water-closeted town. Where tanks are employed for the deposition of the solids, and the fluid is clarified by chemicals, one acre of land, prepared as a land-filter, may serve for five hundred of the population. But a hard-and-fast rule cannot be specified, and "much will depend on management." With respect to the injurious charges brought against sewage farms, we are told that "inquiry, experiment, and "experience disprove them." A sewage farm need not be turned into a swamp, as only one-twentieth part of the entire area should ever, as a rule, be under sewage at one time, and sewage should not be applied more quickly than it is absorbed. "The greatest economy" is urged, in preparing land to receive sewage. On some sewage farms, it is said, the money expended per acre in forming and levelling the surface, has exceeded the first cost of the land, thus more than doubling the rent, without giving an equivalent benefit to the farm. In some other cases, nothing has been done to the land but to bring the sewage, and flood it on in a slovenly way—growing weeds rather than grass. Both these extremes are, of course, to be avoided. The fact is adverted to, that many Local Authorities find great difficulty in procuring land for a sewage farm, owing to the prejudice raised against sewage irrigation, or in consequence of the high price demanded for the land. In densely populated manufacturing districts, there are other difficulties in addition, one being the value of water, even though dirty, for some trade purposes. In view of these obstacles, it is suggested that some of the best forms of chemical treatment, combined with concentrated land filtration, may be found serviceable, "though such processes may "be more costly, and not so complete as sewage irrigation."

The history of sewerage works differs from that of the water supply. The former, as constituting a system of general application, date from a recent period. But India, Italy, and even America, furnish us with examples of vast and ancient works for storing and for transmitting water. We are told it is a mistake to suppose that the Romans built their grand aqueducts because they did not fully understand the laws of hydraulics. The proof that these laws were fully understood, and were reduced to practice, is to be found in the existence of syphons and fountains. The modern engineer has the opportunity of using cast and wrought iron for water conduits, so as to supersede aqueducts of stone. The ancients worked with the materials which they found available. Over the immense area of India there are thousands of impounding reservoirs and tanks. Some, now in ruins, were of enormous capacity, and others are in use to this day. The distinguishing features in modern water supply consist in the delivery, by constant service and at high pressure, over the entire area of a town, and into every house, cottage, and tenement. A public supply of water is required to be not less in volume, if practicable, than fifteen gallons daily per head of the population. For villages, however, it may not be possible to obtain more than from five to ten gallons per head.

Such are some of the points touched upon in this official guide-book. The matters discussed are of vital consequence to the health of the community. We have here set before us what "ought" to be done, and which we presume, therefore, is what "can" be done. The picture is that of a city or town furnished with all the means of physical purity. The kingdom is to be purified. The rivers are not to be the receptacles of sewage, and the refuse of towns is to be disposed of without offence. There is to be water in abundance, and in a state of purity. The sewers are to be thoroughly and safely ventilated, so that they shall not disgorge their gases into habitations. It seems, however, that one of the growing evils of the day is that to which we have adverted—namely, the prevalence of floods. Sewers cannot deal with this difficulty, and it is to be feared that the so-called "storm overflows" are but sewer outlets with another name. We fancy that in the future these floods will cause considerable trouble, and will make a large demand on the skill of the engineer.

## Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

### WEIGHTS AND MEASURES ACT, 1878.

Sir,—I have been asked by several companies what they are required to do under the Weights and Measures Act of last session, which came into operation on the first of this month, with reference to the sale of coke, and I shall feel obliged if you will kindly permit me to reply in your columns.

The object of the Act is not to alter the weight or capacity of the weights and measures now by law established, but simply to enforce their adoption in all parts of the country; and the provisions of the Act do not go beyond this. I have looked carefully through it, and cannot find anything that need interfere with existing arrangements respecting coke, whatever they may be.

Hitherto there have been many different customs with respect to sales by weight or measure in different parts of the country. For instance, with respect to measure, it has been the custom in some places to measure dry goods in the same way as liquids—that is, filled up to the brim, but nothing beyond; and in others to pile up the goods, over the top of the measure, into the form of a cone. And with respect to weight, to give in some places 112 lbs. to the hundredweight, and 20 cwt. to the ton only, and in others to give 120 lbs. to the hundredweight, and 21 cwt. to the ton.

These customs having been in existence for many years, have been held by the Courts to have the force of law; and this the Act of 1824, relating to weights and measures, declares "has been the cause of great confusion, and of manifest frauds."

The new Act, therefore, sweeps away all these customs, and provides that every contract, bargain, or sale by weight or measure, made subsequently to the passing of the Act, shall be deemed to be made according to the weights and measures prescribed by the Act, and none other, and, if not so made, shall be void.

The weights and measures prescribed by the Act are the pound for the standard of weight, and the gallon for the standard of measure, and every other weight or measure must be some "multiple or part thereof;" that is to say, with respect to weight, an ounce shall be one-sixteenth part of the pound, a stone shall be 14 lbs., a hundredweight shall be 8 stone, a ton shall be 20 cwt. And with respect to measure, a quart shall be one-fourth part of the gallon, a peck shall be 2 gallons, a bushel shall be 4 pecks, and a chaldron shall be 36 bushels.

The Act gives a scientific definition of the "pound" and "gallon," but does not, as before stated, alter, or in any way interfere with their present weight or capacity, or prescribe that this or that article shall be sold by weight or by measure, but leaves all such matters as they were.

The clauses and parts of clauses in the Act which may directly or indirectly bear upon the sale of coke are as follows:—

"16. A bushel shall be *a hollow cylinder, having a plane base, the internal diameter of which shall be double the internal depth*, and every measure which is a multiple of a bushel, or is a half bushel or a peck, shall be made *of the same shape and proportion* as the above-mentioned bushel.

"17. In using an Imperial measure of capacity, the same shall *not be heaped*, but either shall be *stricken* with a round stick or roller, straight, and of the same diameter from end to end, *or if the article sold cannot, from its size or shape, be conveniently stricken, shall be filled in all parts as nearly to the level of the brim as the size and shape of the article will admit.*

"19. Every contract, bargain, sale, or dealing, made or had in the United Kingdom, which is to be done, sold, delivered, carried, or agreed for by weight or measure, shall be deemed to be made and had according to the Imperial weights or measures ascertained by this Act, or to some multiple or part thereof, and *if not so made or had, shall be void;* and all tolls and duties charged or collected according to weight or measure shall be charged and collected according to one of the Imperial weights or measures ascertained by this Act, or to some multiple or part thereof.

"*No local or customary measures, nor the use of the heaped measure, shall be lawful.*

"Any person who sells by any denomination of weight or measure other than one of the imperial weights or measures, or some multiple or part thereof, shall be liable to a fine not exceeding forty shillings for every such sale.

"22. Nothing in this Act shall prevent the sale, or subject a person to a fine, under this Act, for the sale of an article in any vessel, where such vessel is not represented as containing any amount of Imperial measure, nor subject a person to a fine under this Act for the possession of a vessel, where it is shown that such vessel is not used, or intended for use, as a measure for trading purposes.

"24. Every person who uses, or has in his possession for use, for trading purposes, a weight or measure which is not some denomination of the prescribed standard, shall be liable to a fine not exceeding five pounds, or in the case of a second offence ten pounds, and the weight or measure shall be liable to be forfeited.

"28. Every weight, except where the small size of the weight renders it impracticable, shall have the denomination of such weight stamped on the top or side thereof, in legible figures and letters. Every measure of capacity shall have the denomination thereof stamped on the outside, in legible figures and letters.

"29. Every measure and weight whatsoever, used for trading purposes, shall be verified and stamped by an inspector *with a stamp of verification under this Act.*

"Every person who uses, or has in his possession for use for trading

purposes, any measure or weight not stamped as required by this section, shall be liable to a fine not exceeding five pounds, or in the case of a second offence ten pounds, and shall be liable to forfeit the said measure or weight, and any contract, bargain, sale, or dealing made by such measure or weight shall be void."

The questions which have been put to me are—

1. Can the companies continue to use their present weights and measures, or must they have new weights and measures as prescribed by this Act?
2. Can the companies continue to give heaped measure in the sale of coke, as heretofore, or must they in all cases give stricken measure?

In reply to these questions, all I can say is—

1. That if the measures now in use are in conformity with the provisions of this Act, that is, made in the form and stamped in the manner provided by this Act, they may still be used, but not otherwise.

The Act of 1835, which, before the passing of this Act, regulated weights and measures, authorized the stamping of measures of any shape or size, provided that their cubical contents were the same as the prescribed standard; but this will not do under the present Act.

2. That the words, "the use of heaped measure shall not be lawful," only refer to the legal bearing of the transaction; that is to say, if a company sell a bushel or chaldron of coke, and the purchaser disputes the measure, he can only claim a bushel or chaldron as prescribed by this Act; he cannot plead that the company are accustomed to give heaped measure, and therefore he is entitled to it, as the law now will not recognize heaped measure. But this does not prevent a company giving a quantity in excess of that actually paid for, if they think fit so to do. The same course might be adopted with any other article, but if any tolls or duties were payable upon it, they would have to be paid on the quantity actually delivered, as weighed or measured in accordance with the provisions of this Act, and not upon the quantity nominally sold.

The Act of 1835 prohibited the use of heaped measure in almost the same terms as this Act, but for the want of some stringent provisions to enforce it, which this Act is intended to supply, it has hitherto, to a large extent, been evaded.

It is customary occasionally to bargain for 21 cwt. of coals to the ton; but under this new law no such bargain could be enforced, and any contract containing such a provision would be altogether void.

Every company should be possessed of the Act. The price is 1s. 6d., and I will send a copy by post to any company requiring it, whether belonging to the Gas and Water Companies Association or not, upon being requested to do so. WM. LIVESEY, Secretary.

*Gas and Water Companies Association, 6, Victoria Street, Westminster Abbey, S.W., Jan. 4, 1879.*

## THE ELECTRIC LIGHT.

SIR,—Given a fulcrum, and you may accomplish anything! One of the electrical correspondents of *The Times*—and to whose letters the leading journal has given much prominence—Mr. St. George Lane Fox, only requires the public to dethrone its judgment, and to swear allegiance to his definitions, technicalities, theoretical calculations, estimates, per centages, probabilities, energies of combustion, transformations, and potentialities, and—arm in arm with that "American of the Americans," Mr. Edison—he will convince the world "that gas and gas-works will, before long, be dead and gone." Such are his words.

But I venture to tell Mr. Fox that he will find the public—the public of to-day—with its recent severe lessons, "not such a fool as it looks."

They are not in a mood, just now, to be bothered with theories and assumptions hatched in the closet, and dealing so dogmatically with the future, while actual electric lighting has scarcely yet got beyond the mere threshold of experiment. "Don't prophesy unless you know," said a shrewd American; and I commend the maxim to Mr. Fox.

We business men are more disposed to pin our faith to the statement of those practical electricians who have really invented something that yields a profit—for a time—and not a loss (such as Dr. Siemens, M.Rapieff, M. Jablochkoff, and the like), and who have committed themselves to the opinion—publicly expressed—that the electric light "will not take the place of gas for our streets or in our houses," to quote the words of Dr. Siemens. Even Mr. Fox's tutor and electric friend, Mr. Ladd, has publicly avowed that, were he a gas shareholder, he would not sell his shares!

It will be time enough to work up gas shareholders fears into a fresh panic when the Metropolitan Board of Works and the City Authorities have reported in favour of the electric light, and when contracts for lighting our streets and houses with electricity are under official negotiation. But Mr. Fox's impatience has got the better of him, and he wants to "overthrow gas" now; as virtually avowed in his letter in *The Times* of the 26th ult. But when he can prove to us unideal City men, accustomed to go straight to the point, that any one of the various electric patents which he has applied for is being worked to a profit, he will have established a claim to be heard. We are fairly entitled to put this rather pointed question to one who professes to have at his fingers ends a cut-and-dried process for putting an immediate extinguisher upon gas.

His ingenious friend, Mr. Edison, glories in a similar object, and his agents are for ever darkening the doors of the Patent Offices here and in America. But out of about 270 of his patents, only about half a dozen, at most, are understood to be financial successes! And if Mr. Fox is working on the same line—*cui bono?*

Public experience of previous lighting scares, and of the plausible theories of scientific promoters, with their cabalistic, "That's how it's done," by which the credulous and unwary were entrapped into very ruinous schemes, ought to be a caution to every man with money in his pocket. Of course, men with limp purses, that "won't throw against the wind"—and there are plenty of them about just now—are always ready to be co-partners with the solid public in any project. But, at the present moment, the public may be left to take care of themselves; as few of them are in a temper to be "pleased with a rattle," or "tickled with a straw."

A story is told of a Scotch clergyman, who, suffering from a draught in the pulpit, called out several times, "Shut that west door!" "Man! Donald," exclaimed one of his congregation to his companion, on their way home, "wasn't our minister grand upon th' door th' day!" Equally grand is *The Times* correspondent, Mr. St. George Lane Fox, upon "central stations," "mains," "smaller mains," "branches," and "branches," and so forth; and beside whom our practical engineers, surveyors, and electricians must be considered a set of fools. Are they a set of fools?

*London, Jan. 1, 1879.* A GAS SHAREHOLDER.

## GAS-ENGINES.

SIR,—Mr. A. F. Wilson, in his excellent article, in the JOURNAL of the 24th ult., upon the "Extended Use of Gas," in speaking of gas as a motive power, says the gas-engine is "cleanly and safe, and, at a distance from coal-pits, it is probably, even upon the fuel account, economical." This is doing but scant justice to one of the chief merits claimed for the gas-engine of the present day, compared with its steam rival—viz., its greater economy for small power, and especially when the work is intermittent.

In London, where gas-engines up to 14-horse power indicated are rapidly supplanting small steam-engines, it has been shown over and over again that work which was done by steam power at a cost of from 30s. to 40s. a week, can be done by gas at a cost of from 10s. to 12s. a week. Where gas replaces steam, the boiler attendant is dispensed with, in many cases with a saving of from 12s. to 18s. a week.

Gas-engines are being introduced as auxiliaries to steam power, and with satisfactory results. To take one instance out of many:—At a large printing establishment in the City, a 50-horse power engine and boilers are used. In order to work a small printing machine all night, requiring less than 2-horse power, the large engine and long line of shafting had to be set in motion, and the boiler attendant had to be on duty all night. It was at last decided to apply to the machine a gas-engine, which could be started and oiled by the printer. It answered, and still answers, admirably; and, within nine months, the saving effected in the difference between the cost of gas and coal, and the saving in wages were sufficient to cover the whole cost of outlay upon the gas-engine.

The inspectors of gas companies have sometimes expressed their disappointment at the smallness of the consumption where gas-engines are used. Now, it is this very smallness of consumption they should be glad to observe, as it will, in a year or two, cause the number of engines to be multiplied. It is far better for gas companies that they should have 100 engines, each using £25 worth of gas a year, than 10 engines using £100. The cheaper the power, the greater will be demand and consumption.

There are many builders, printers, hotels, &c., having small steam-engines and boilers, the use of which causes a depreciation in the value of the dwelling-houses in the vicinity, in consequence of the smoke and dirt from the boilers. By using gas-engines, the smoke nuisance in such case would be stopped, and a great saving effected. It would be a great boon to the dwellers in many localities if the authorities would be more stringent, even to the prohibition of the use of steam-boilers, where the dirt they make is such a nuisance.

Now that gas-engines, on the "Otto" principle, up to 30-horse power are being made, the use of steam-boilers, and the accompanying smoke and dirt, are no longer indispensable for the carrying on of many industries requiring small power; and the time is probably not far distant when the authorities will be more stringent in allowing steam to be used, seeing that it can be replaced by a cheaper motive power, to the great advantage of the user himself, as well as to his neighbours.

The prejudice amongst engineers against gas-engines is rapidly disappearing, since the introduction of the "Otto" gas-engine. So long as gas-engines were made wrong in principle, the prejudice and dislike were well-founded; but now that a method of applying a mixture of gas and air for obtaining motive power, upon sound principles, has been discovered, and its success fully established, the ground for the prejudice against gas-engines no longer exists.

116, *Queen Victoria St., E.C., Jan. 2, 1879.* ROBERT WILSON.

THE GAS QUESTION AT WARRINGTON.—A correspondent of the *Warrington Examiner*, writing on this subject, says:—"During the recent wearisome discussions by the Warrington Town Council, on the question of extending the gas-works, I think the Corporation might have silenced the opposition, and given great satisfaction to all consumers of gas in the borough, if they had announced their determination of doing what is already done in many towns—viz., of sharing the profits accruing from the works amongst consumers of gas. At present, what profit may be left after all claims are paid, is thrown into the general fund, and goes towards reducing the rates—a mode of dealing with the question which, on consideration, is manifestly unfair, as the man who consumes no gas has his rates reduced at the expense of the consumers of that commodity; and the so-called 'profit' which is made by the Corporation on gas, which would be the legitimate reward for private speculation, resolves itself, on the part of a public Corporation, into nothing less than the result of an overcharge upon the gas consumers. Were this profit returned to the consumers in the shape of a bonus or reduction of so much per 1000 cubic feet, according to the profit made, it would be felt as a great boon, and in the case of large manufactories, would be a very considerable reduction on working expenses. As a matter of fact, however, it is not the manufacturers but the householders who are the great consumers; and to this class especially a reduction would be welcome. If the electric light were substituted for gas in any large works, that manufacturer, by not paying gas bills, would cease at once to contribute to the rates by the amount of profit ordinarily derived from his gas consumption, and yet, under the existing rule, his rates would be reduced by the profit accruing from the gas burned by other consumers. The suggestion I throw out would remedy any such anomaly, would be an incentive to people to consume gas, and would put those unable to use the electric light on a more equal footing with those large consumers who may at some time find it either profitable or advantageous to discard gas."

# Legal Intelligence.

## RICHMOND PETTY SESSIONS.—Wednesday, Jan. 1.

*(Before Mr. E. H. L. Penrhyn, Chairman, and a Bench of Magistrates.)*

SUPPLYING GAS TO A CLUB.

Mr. *Frederick Pope*, of the Richmond Club (late County Residential Club), Richmond Green, was summoned for non-payment of a sum of £3 15s., for gas supplied by the Richmond Gas Company to the establishment. He put in a plea of "not indebted."

Mr. F. B. Senior appeared for the Gas Company, and defendant was not represented by Counsel.

Mr. *Giles*, the Company's Collector, stated that he had made repeated applications for the money, and defendant had sent him a cheque for the amount, but it had been returned dishonoured. Defendant had made previous payments, in cash sometimes, and at other times by cheque.

*Defendant*, in answer to the claim, said that this was a summons for gas supplied up to the 30th of Sept. last, and he had nothing more to do with it than any one then present. The gas was supplied on a written application of the County Residential Club Committee, signed by the then secretary, Mr. Taylor. He (defendant) was a guarantor for the payment of the gas, in the event of the County Residential Club failing to carry out their contract. The club ceased to occupy the building on the 28th or 29th of September, and it was then let to the new club. The Gas Company being about to cut off the supply, he was anxious to prevent that from being done, and said he should be willing to pay the amount as a guarantor; but he submitted that this was a very different thing from being called upon to pay the bill as a matter of right. The proper thing for the Gas Company to do was to prove in the liquidation of the County Residential Club. If they proved there, possibly he might be liable for the guarantee he had given; but he took it that he was only a consumer, and it did not follow, if he admitted his liability, that he was the right person to be summoned because he had volunteered the payment of the debt. Moreover, the money was tendered to the collector by some gentleman connected with the club.

Mr. *Giles* denied this, but said that, after the gas was cut off, two gentlemen called upon him, and said that if the gas were laid on again, the money should be paid.

A Magistrate: The guarantor expects that you should seek to recover in the first instance from his principals.

The Chairman: Has he himself applied to have the gas in any form whatever, or has he only signed the guarantee?

Mr. *Giles*: I could not tell you exactly what the words were; but they must have been satisfactory to the Company, or else they would not have supplied the gas.

The Chairman, having conferred with Mr. Senior, said the case would be adjourned for a week, that the proper proofs might be forthcoming.

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Unlawfully Taking Gas at Newbury.—At the Newbury Borough Police Court, on Friday, the 27th ult., before a full bench of magistrates, a charge was preferred by Mr. O'Farrell, the Manager of the Corporation Gas-Works, against a Mr. Lobel, an auctioneer, who travels the country with American watches and jewellery, of having surreptitiously connected his gas-fittings with a service-pipe in the North Brook Street Lecture Hall, which pipe was unmetered. Lobel said he left his manager to make his business arrangements, and he knew nothing about this matter himself until the Gas Manager spoke to him about it, when he refused to pay for the gas, considering the charge made was too high. The Magistrates fined him £5, together with the costs and the amount of the gas account. Lobel paid the amount, but gave notice of appeal.

# Miscellaneous News.

## METROPOLIS GAS SUPPLY.

The following is an extract from the report of Professor Williamson, F.R.S., the Chief Gas Examiner to the Metropolitan Board of Works, for the quarter ending Dec. 31, 1878:—

I. *With respect to Illuminating Power.*—The following are the averages for the quarter, in standard sperm candles:—

| | |
|---|---|
| The Gaslight and Coke Company— | |
| Common gas— | |
| Beckton | 16·9 |
| Friendly Place | 16·7 |
| Cannel gas— | |
| Millbank Street | 21·9 |
| Common gas— | |
| Camden Street | 16·6 |
| Graham Road | 17·7 |
| Carlyle Square | 16·9 |
| Ladbroke Grove | 17·6 |
| Devon's Road | 16·7 |
| Commercial Gas Company— | |
| Parnell Road | 17·2 |
| Wellclose Square | 17·3 |
| South Metropolitan Gas Company— | |
| Hill Street, Peckham | 16·7 |

From these results it will be seen that the average at all the stations has been above the standard required by the Acts of Parliament. The gas made by the Commercial Gas Company has averaged well above the standard, and has never fallen down to that standard, even when weakest. At Beckton, North Woolwich, the gas, *from an unavoidable cause*, fell once during the past quarter below the requirements of the Acts of Parliament.

II. *As regards purity.*—Sulphuretted hydrogen has not been present in the gas at any of the stations. The *average* proportion of sulphur, in other forms than this, was as follows:—

| | *Grains of Sulphur per* 100 *Cubic Feet of Gas.* |
|---|---|
| The Gaslight and Coke Company— | |
| Beckton | 12·6 |
| Friendly Place | 14·1 |
| Millbank Street | 15·8 |
| Camden Street | 14·8 |
| Graham Road | 12·7 |
| Carlyle Square | 13·3 |
| Ladbroke Grove | 19·1 |
| Devon's Road | 14·4 |
| Commercial Gas Company— | |
| Parnell Road | 12·8 |
| Wellclose Square | 13·2 |
| South Metropolitan Gas Company— | |
| Hill Street, Peckham | 13·9 |

From these results it will be seen that the average at most of the stations has been better than required by the Acts, and, in most cases, considerably so. There was a slight excess of sulphur on the 11th of November, at the Ladbroke Grove station, which arose from an unavoidable cause. Ammonia has been present in small quantities at all the stations of The Gaslight and Coke Company, with the exception of Devon's Road, Bromley. The average at all the stations is considerably below the parliamentary limit.

The station at Beckton was closed for repairs on the 5th of November, and re-opened on the 18th of December.

## METROPOLIS WATER SUPPLY.

The following are the returns of the Society of Medical Officers of Health on the Composition and Quality of the Metropolitan Waters in December, 1878:—

| Names of Water Companies. | Total Solid Matter per Gallon. | Oxygen required by Organic Matter, &c. | Nitrogen — As Nitrates, &c. | Ammonia. — Saline. | Ammonia. — Organic. | Hardness (Clark's Scale). — Before Boiling. | Hardness (Clark's Scale). — After Boiling. |
|---|---|---|---|---|---|---|---|
| *Thames Water Companies.* | Grs. | Grs. | Grs. | Grs. | Grs. | Degs. | Degs. |
| Grand Junction | 23·70 | 0·075 | 0·180 | 0·000 | 0·010 | 15·9 | 4·0 |
| West Middlesex | 23·30 | 0·089 | 0·090 | 0·000 | 0·010 | 14·3 | 4·2 |
| Southwark and Vauxhall | 22·20 | 0·115 | 0·120 | 0·000 | 0·006 | 14·3 | 4·6 |
| Chelsea | 22·50 | 0·073 | 0·120 | 0·000 | 0·010 | 14·8 | 5·1 |
| Lambeth | 22·00 | 0·103 | 0·105 | 0·000 | 0·010 | 14·3 | 5·2 |
| *Other Companies.* | | | | | | | |
| Kent | 29·50 | 0·002 | 0·360 | 0·000 | 0·002 | 17·6 | 5·1 |
| New River | 21·40 | 0·057 | 0·165 | 0·000 | 0·005 | 14·8 | 4·2 |
| East London | 23·00 | 0·065 | 0·105 | 0·000 | 0·009 | 14·8 | 5·1 |

*Note.*—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours.

The water was found to be clear and nearly colourless in all cases.

C. Meymott Tidy, M.B., &c.

## THE PROPOSED PURCHASE OF THE EXETER GAS-WORKS BY THE CORPORATION.

As was universally expected, the poll upon the proposal to purchase the Exeter Gas-Works has ended in the defeat of the scheme by a large majority. The voting-papers were examined last Wednesday, at the Guildhall, and, in the afternoon, the Mayor (who acted as returning officer) declared the result, as follows:—

| | Voters. | Votes. |
|---|---|---|
| Against | 3142 | 4437 |
| For | 520 | 1018 |
| Majority | 2622 | 3419 |

There were 289 spoilt voting-papers, and 1120 of the total collected were unmarked. About 6600 papers were issued, and of these 100 and upwards were returned through deaths and voids. It thus appears that no less than 2549 voters did not trouble themselves to vote, 1120 returning their papers blank, and 1429 not returning them at all. To indifference as well as to active hostility, the defeat of the purchase is, therefore, to be attributed. The majority is 6 to 1 on the number of voters, and more than 4 to 1 on the number of votes. The larger ratepayers were evidently more in favour of the purchase than the smaller ratepayers. Considering the apprehension as to the supercession of gas, caused by Edison's electric light invention, the extraordinary misrepresentations as to the imposition of a shilling rate, and the energetic way in which the opposition was conducted, while there was no organization in defence of the scheme, the result is not a matter for surprise. That the ratepayers should defeat a proposal sanctioned by a unanimous vote of the Town Council, is remarkable; but we question whether a proposal to buy gas-works could anywhere command the popular vote, in the face of the prevailing belief as to the wonders the electric light may shortly achieve. The Council could do no other, situated as they were, than test the feeling of the ratepayers by a poll. A popular cry induced the Town Council to negotiate the purchase, and a popular vote has defeated the negotiations. "A breath can wither as a breath has made."—*Exeter Gazette.*

## ANNUAL FESTIVAL OF THE DUNDEE GAS-WORKS *EMPLOYES.*

In our "Trade Notes from Scotland" last week a brief reference was made to this gathering, which took place on Friday, the 27th of December. Mr. B. M. M'Crae, the Manager of the gas-works, presided, and there were about 500 persons present.

The Chairman commenced his introductory address by wishing all present "A Happy New Year," and expressing the good it did his heart to see so many working men and their wives and intended wives. It was also gratifying, he said, to see so many of the Commissioners present at their annual festival. During the past year they had been fairly successful. When he said so, he was speaking from his own knowledge, from the position he held in the concern, and he was speaking from the good nature that had been displayed towards them by their customers in Dundee. They had interfered very little with them, and that was the best evidence that they had been fairly successful. It became him, and it also became them, specially to thank the Commissioners for the very liberal spirit they had all along manifested towards them, in enabling them to make the works so efficient that the men were much more comfortable at their work. In their liberality in that direction they had the satisfaction that they were at the present time supplying Dundee with the cheapest gas in Scotland. But the Commissioners could do very little in the way of cheapening the gas if they had not the co-operation of those before him. He thanked the men in his department for the earnestness and zeal they had shown in the performance of their duty. They had no doubt seen in the papers a great deal about the electric and other kinds of lights. They should never turn up their noses and sneer at anything until they really knew what it was. Scotchmen, as a rule, did not run away when anything came in their way, but they took a closer grip, and he believed that would be the case here. He wished every man belonging to the establishment to make up his mind that from this day forth he should try not only to have the gas in Dundee the cheapest in Scotland, but at 3s. per 1000 feet. That would be about 9d. cheaper than the cheapest in Scotland. It did not require any albo-carbon light to do that. These patents would, no doubt, be taken advantage of when they turned up legitimately, and with the concurrence and support of the Commissioners; but all the patents in creation would never make good and cheap gas if they did not get what he was going to ask of them. He was getting pretty old now, but he did mean to be selling gas in Dundee at 3s. per 1000 feet. Would they believe it—they lost as much gas in the streets and through the people's houses as would bring the price down to 3s. 2d. per 1000 feet at once? Could they not do something to reduce it? There was not a man at the works but saw every day some little thing he could have prevented going to waste. If every man at the works felt that this was his duty, and that, while the performance of it might redound to the good of Dundee, he would become more capable by doing it, he would also become happier. Whenever he saw a man who did his work, he saw a happy man; and whenever he saw a man who skulked his work, he saw one who was miserable. It was his desire that every man who had

the opportunity of preventing even a farthing's worth of loss should consider it his duty to do it. There was a little pride about him, and that was the pride of excelling. If he could get his department as perfect as that of the Treasurer's, the gas would be 3s. per 1000 feet next May. But although they could not very well do without the Commissioners, and without himself, and without Mr. Matthew, and without the foremen, and without the workmen, much less could they do without their wives. If the wives of Dundee knew the power they had for good, and exercised it, there would not be such an outcry of dull trade as they now felt. What metal did it not put into a man's heels when he went out to work to know that he would return to a happy home? In conclusion, he remarked that the more the wives tried to make their husbands happy and comfortable, the more happy and comfortable they themselves would be.

At the conclusion of the address, which was received throughout with much applause, some other brief speeches followed, and then an entertainment of vocal and instrumental music, interspersed with readings and recitations, was given.

## THE GENERAL GAS LIGHTING AND HEATING COMPANY OF BRUSSELS.

At the Annual General Meeting of the above Company, held in Brussels on Dec. 23, 1878, the following report and statements of account were presented by the Board of Direction:—

The Directors have the honour of laying before the Shareholders the results of the Company's operations for the year ending Aug. 31, 1878.

The working for the past year has produced a net profit of 1,914,288 frs. (£76,572), which exceeds by 163,762 frs. (£6550), or 9·35 per cent., the profit made in the preceding year. This is attributable to several causes, among which may be cited the increased sale of gas (which amounts to 5·21 per cent.) compared with the year 1876-77, and to the improvements resulting from works that had been previously executed.

It will be useful to call attention to one point in connection with this item of profit, and that is, that it would have reached a much higher figure had not a considerable sum been expended on improvements during the year, as well as in liquidation of the liabilities on the works on Aug. 31, 1878. This latter sum amounts to nearly 195,000 frs. (£7800), being 79,000 frs. (£3160) for works, and 116,000 frs. (£4640) for outstanding balances.

We regret that the financial condition of the Company does not allow of the payment of a dividend in proportion to the profit made; but as, under the statute, we are not allowed to increase the number of our shares and bonds, intended to provide the capital for works of first establishment, we are obliged to carry to the sinking-fund a sum of 690,000 frs. (£27,600), and to pay a dividend of 20 frs. (16s.) only, or 4 per cent. We hope that the Shareholders will approve of this measure, which is really for the general good of the Company.

Before passing to a detailed account of our several stations, we think it will be advisable to say a few words respecting the recent applications of the electric light—applications which have given the shareholders in gas companies a great deal of uneasiness. We pay considerable attention to any information we may obtain, as well as to any documents that may come into our hands on the subject. If these applications of the electric light constitute real progress in a few special cases, such as for lighthouses, signals, or large workshops, gas light still retains, in the majority of instances that may occur, all the advantages of economy, regularity, and convenience of employment. The conclusion arrived at by the scientific and commercial notabilities who have studied the matter is, that the electric light, even in its present state of perfection, will be in no way injurious to gas lighting, as far as regards the property possessed by the latter of being used as a profitable and remunerative means of illumination.

*Charleroi.*—The sale of gas in Charleroi and its neighbourhood has made but little progress, in consequence of the great depression in trade. The profits have, however, increased to a certain extent, and seem to promise still further augmentation next year.

At this station we have put up a fresh condenser, enlarged the coal-store, and built a new exhauster-house. The Piéton sustaining wall has been finished, and new boilers have been fitted. The main-laying operations have, however, been by far the most important, especially at Charleroi and Jumet, where the work has had to be done by virtue of stipulations we had entered into there, as well as at Marchienne-au-Pont, for the supply of the large quantity of gas required for lighting the St. Martin Railway Station, and the offices and buildings connected therewith. The new mains laid are as follows:—Charleroi, 2000 mètres; Dampremy, 171; Gosselies, 156; Jumet, 1629; Lodelinsart, 660; Marchienne-au-Pont, 309; Monceau-sur-Sambre, 250—total, 5175 mètres (3 miles 375 yards). There have also been 2160 mètres (1 mile 600 yards) of old main taken up and relaid between Marchienne and Charleroi.

We are negotiating with the Belgian Government a ten years contract for the lighting of eight railway stations in the neighbourhood of Charleroi, and we have every reason for believing that these negotiations will be successful.

*Châtelet.*—The profits realized at this station are considerably in excess of those previously made. In addition to the new mains land, the canalization works commenced last year have been completed. The old offices on the works have been pulled down, and the cellars of the house converted into receptacles for tar and ammoniacal liquor. We have laid 1380 mètres (1500 yards) of new mains, and relaid 357 mètres (390 yards) of worn-out pipes.

*Tournai.*— As we informed you last year, we purchased at Kain-les-Tournai, on the banks of the Eschaut, a plot of land on which we purposed erecting new works, and these are now being pushed forward with all possible vigour. We have already completed a gasholder of 5000 cubic mètres (176,500 cubic feet) capacity, and have dug out the foundation for a second holder of similar dimensions, which will be erected in the course of next year. We have also erected retort and purifying houses, exhauster-house, workshop, and storehouse. The brickwork has been finished of eight retort-benches, placed back to back, each consisting of eight retorts, heated by generator furnaces, and provided with Morton's patent self-sealing retort-lids. Four purifiers, capable of passing 15,000 cubic mètres (530,000 cubic feet) in 24 hours, have been fitted up; also two of Körting's exhausters, each for 10,000 cubic mètres (353,000 cubic feet), two scrubbers, and a station-meter equal to the registration of 10,000 cubic mètres daily. A 10-ton weigh-bridge has been added to the works, and 16 and 20-inch outlet-mains have been laid down. We hope to have the new works in operation on Jan. 1, 1879. The old mains have been increased altogether to the extent of 960 mètres (about 1000 yards).

*Louvain.*—These works are situated in a very thriving locality, and the benefits resulting from our working have increased very satisfactorily, although a portion of the expenses incurred in laying down new mains has been defrayed out of the profits realized. In order to be in a position to meet the growing increase in the sale of gas, we have been compelled to erect a third telescopic gasholder of 3600 cubic mètres (127,000 cubic feet) capacity, which will soon be in operation.

As at Charleroi, Dunkirk, and Valenciennes, our main-laying works have been very extensive. We have not only put down 1226 mètres (1260 yards) of new mains, but have taken up, and replaced by others of larger diameter, 4398 mètres (nearly 2¾ miles) of old pipes, a large portion of which were of stoneware. These works have been undertaken with the object we have in view in the management of all our stations—viz., giving the consumer all the gas he requires, and, at the same time, reducing the leakage as much as possible.

*Anderlecht.*—We have reason to be satisfied with the results obtained at this station, both the profits and the sale of gas having shown marked progress. The works carried out here have been restricted to the laying of mains, of which 175 mètres (190 yards) of new have been put down, and 513 mètres (560 yards) of old taken up and replaced by larger sizes.

*Herstal.*—For several years there has existed at this station a foundry for the manufacture of cocks and taps, and other metal work required for gas-fittings. This business not having been so productive as we anticipated, we determined on discontinuing it. We have now done so, and the loss sustained has been defrayed out of the profits for the year 1877-78.

*Valenciennes.*—Our station at Valenciennes continues to show satisfactory results. Notwithstanding the industrial crisis, the sale of gas has considerably increased over that of last year, and the profit realized has consequently been proportionately greater. The works have been rendered more efficient by the erection of apparatus for the treatment of the tar and ammoniacal liquor, and 2538 mètres (2775 yards) of old wooden pipes have been taken up and replaced by cast-iron mains of increased diameter.

*Arras.*—Here also an increase has taken place in the consumption of gas, and likewise in the profits made. There have been 106 mètres (116 yards) of new mains laid at this station.

*Dunkirk.*—These works show considerable progress over the previous year's operations. We have taken up 4072 mètres (about 2½ miles) of old stoneware pipes, and replaced them with others of cast-iron; this will probably enable us to postpone for a year or two the erection of the new works which the continued development of our business at this station urges upon us.

*Cambrai.*—A great improvement has taken place at this station. We have been compelled, by virtue of our contract with the Municipality, to lay down mains in some of the outskirts, and these are the only works of any importance that have been executed here during the year.

*St. Omer.*—The manufacturing plant at this station being generally defective, we have begun to renew it. Up to the present time we have fixed a new hydraulic main, and erected four purifiers, which have been removed from other stations. We have also fitted up a new governor and pressure regulator, and 947 mètres (about 1000 yards) of mains have been relaid.

*Fourmies.*—The sale of gas is increasing at this station. No profit, however, is for the present being realized, in consequence of the reduction we have been compelled to make in our charge to the spinners, who are our principal consumers; but the existing condition of things will undoubtedly improve hereafter. A well has been sunk on the works; the mains have been extended by 838 mètres (917 yards), and 240 mètres (263 yards) of old mains have been taken up, and others of larger calibre substituted.

*Bergues.*—At these small works, where both the sale of gas and the profit realized have increased, 589 mètres (644 yards) of stoneware pipes have been taken up, and cast-iron ones substituted for them.

Our stations in Austria and Germany have produced satisfactory results during the past year. The sale of gas and the profits made have alike exceeded those for the year 1876-77, especially at Trèves and at Prague.

*Prague.*—The works executed here during the past year were confined to laying and replacing mains. There were 371 mètres (405 yards) of new mains laid, and 1157 mètres (1265 yards) of old ones of insufficient diameter taken up.

*Chemnitz.*—The canalization works at this station consist of the laying of 2022 mètres (1 mile 450 yards) of new mains.

*Trèves.*—The sales of gas and the profits obtained both show an increase over those for the year 1876-77, and during the past twelve months satisfactory results have been achieved. We have succeeded in obtaining the contract for lighting the outlying districts, and this will remain in force till the year 1900. This has necessitated the extension of our mains by 1521 mètres (1642 yards), as well as the fixing of 40 public lamps.

*Catania, Sienna, Rimini.*—The year's working at our three Italian stations presents no special features. The sale of gas has slightly increased, principally at Rimini; but no works of any importance have been carried out.

We will now make a few statements relative to the general progress of our undertaking.

The sale of gas has increased to 17,943,668 cubic mètres (633½ million cubic feet), against 17,054,686 cubic mètres (about 602 million cubic feet) in 1876-77; this increase of 888,982 cubic mètres (31½ million cubic feet), being at the rate of 5·21 per cent., and, consequently, higher than the per centage of the previous year.

On Aug. 31, 1878, the total number of public lamps supplied was 205,856, against 195,364 on Aug. 31, 1877; being an increase of 10,492. The average consumption of each lamp was 87·16 cubic mètres (or 3076·75 cubic feet), instead of 87·297 cubic mètres (or 3081·58 cubic feet) in 1876-77; so that it has remained almost stationary.

With regard to the yield of gas, satisfactory progress continues to be made. We have obtained per 100 kilos. (220 lbs.) of coal carbonized, 27·64 cubic mètres of gas (about 9760 cubic feet per ton). The yield for the three preceding years was as follows:—1874-75, 22·88 c.m.; 1875-76, 24·16 c.m.; 1876-77, 26·22 c.m. A considerable improvement has, therefore, taken place, which cannot but favourably affect our profits.

For every 100 kilos. of coal carbonized, we have obtained 63·87 kilos. (140·5 lbs.) of coke (about 18 bushels to the ton); 4·93 kilos. (10·8 lbs.) of tar, and about 9 litres (about 2 gallons) of ammoniacal liquor of 2·5° strength (about 11 gallons of tar and 20 gallons of ammoniacal liquor to the ton). These results show an advance on those of previous years.

The price of coal has fallen very considerably this year, in consequence of the stagnation in the manufacturing trades. Believing that the rate had reached its minimum, we thought it advisable at once to make our purchases for the supply of our works for the next and two following years, and we have succeeded in obtaining contracts at the prices quoted for immediate delivery.

With regard to coke, the price has fallen slightly; but with the exception of one or two of our stations, we have not a very large stock on hand.

As the contracts for the tar produced at our Belgian and French stations will expire on Dec. 31, 1878, we have renewed them for a term of three years from that date. It has not been possible to obtain, on the new contracts, any advance on existing prices; but the terms we have accepted are very favourable, considering the great fall that has taken place in the market price of this residual. The contracts for our ammoniacal liquor continue to work satisfactorily.

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We will now lay before you a few items in our balance-sheet and profit and loss account, to which we invite your attention.

*Assets and Liabilities.*—The increase in the item of "Expenses of first establishment" amounts to 775,712 frs., apportioned as follows:—

| | Francs. | Sterling. |
|---|---|---|
| Lands | 68,541 | £2,742 |
| Buildings | 205,403 | 8,216 |
| Plant and apparatus | 220,500 | 8,820 |
| Mains | 281,268 | 11,250 |
| Total | 775,712 | £31,028 |

The item "Sundry debtors" consists of the debtors of our works. There is an increase of 37,193 frs. (£1488) in the item "Difference between the issue and redemption prices of bonds," although the sum of 30,341 frs. (£1212) has been paid off. This arises from the issue of the 1332 new bonds created in 1876.

The "Plant, carbonizing materials, tools, &c.," comprise—

| | Francs. | Sterling. |
|---|---|---|
| Working plant, apparatus, tools, &c. | 605,747 | £24,230 |
| Meters, &c., on hire | 233,602 | 9,344 |
| Coal | 213,396 | 8,536 |
| Residual products | 105,357 | 4,214 |
| Miscellaneous | 68,405 | 2,736 |
| | 1,226,507 | £49,060 |

We have redeemed 969 bonds of the several issues named—viz., 460 issued in 1867, 316 in 1868, 192 in 1874, 1 in 1876; and, as previously stated, 1332 of the new bonds created in 1876 have been issued.

The reserve and sinking funds, including the sums taken from the profits of the present year, now amount to 2,926,045 frs. (£117,041), against 2,210,811 frs. (£88,432) on Aug. 30, 1877.

In the item, "Bonds and coupons due, but unpaid," is included the sum of 123,044 frs. (£4922), the amount taken from the profits of the present year's working to meet the coupons falling due in 1878-79.

The item, "Sundry creditors," consists of the amount owing to the bankers, £202,557 frs.; and creditors of the works, 211,575 frs.—total, 414,132 frs. These two amounts, including the item, "Balance due on the Anderlecht works," formed the item of "Sundry creditors" in previous balance-sheets.

*Profit and Loss.*—The profits this year have, as we have said, amounted to 1,914,288 frs. (£76,572). This exceeds by 163,762 frs. (£6550), or 9·35 per cent., the profit made on the working for the year 1876-77, although considerable amounts have been disbursed in reductions and liquidations.

The item, "Coupons and difference between issue and redemption price of bonds," has increased to 621,754 frs. (£24,870), consequent upon the issue of the 1332 new obligations, against 610,901 frs. (£24,436) on Aug. 31, 1877; but, *per contra*, the "Bankers commission, interest, &c.," has decreased from £50,044 frs. (£2002) to 18,349 frs. (£734).

The "General expenses," which were 104,232 frs. (£4169) in 1876-77, have been considerably reduced, and now only amount to 93,339 frs. (£3734).

The "Sinking-fund for works of first establishment" is 200,000 frs. (£8000) in excess of the figure for the preceding year. It now stands at 690,000 frs. (£27,600).

Deducting the above amounts, there remains a clear profit of 495,843 frs. (£19,834), which it is proposed to employ as follows:—

| | Francs. | Sterling. |
|---|---|---|
| To reserve-fund (being 4 per cent. on last amount) | 25,234 | £1,009 |
| Dividend of 20 frs. per share | 467,100 | 18,684 |
| Balance carried forward | 3,509 | 140 |
| Total | 495,843 | £19,833 |

The dividends of 20 frs. per share will be paid, as usual, on and after Jan. 1, 1879, at Brussels, Paris, Frankfort-on-the-Maine, Hamburg, Geneva, Neufchâtel, Zurich, Basle, Schaffhausen, and Winterthur.

Dr.—*Statement of Assets and Liabilities, Aug.* 31, 1878.

| | Francs. | Sterling. |
|---|---|---|
| To Share capital (23,355 shares) | 11,677,500 | £467,100 |
| Bonds (11,677,500 frs.), viz.— | | |
| 4776 A (1867) | 2,388,000 | 95,520 |
| 7540 B (1868) | 3,770,000 | 150,800 |
| 7284 C (1874) | 3,642,000 | 145,680 |
| 40 D (1876) | 200,000 | 8,000 |
| 3355 E (1876) | 1,677,500 | 67,100 |
| Reserve-fund | 656,102 | 26,244 |
| Sinking-fund | 2,269,943 | 90,798 |
| Unpaid dividend warrants | 5,623 | 225 |
| Bonds and coupons due, but unpaid | 203,044 | 8,122 |
| Balance due on the Anderlecht works | 195,026 | 7,801 |
| Sundry creditors | 414,132 | 16,565 |
| Bills payable | 135,215 | 5,409 |
| Dividend of 20 frs. per share | 467,100 | 18,684 |
| Carried to profit and loss account | 3,509 | 140 |
| | 27,704,694 | £1,108,188 |

Cr.—*Statement of Assets and Liabilities.*

| | Francs. | Sterling. |
|---|---|---|
| By General expenses of first establishment | 23,844,807 | £953,792 |
| Extensions of works and mains | 775,712 | 31,028 |
| Sundry debtors | 597,433 | 23,897 |
| Amounts received on deposit | 45,216 | 1,809 |
| Difference between the issue and redemption prices of bonds | 1,103,420 | 44,137 |
| General benefit and relief funds | 44,813 | 1,793 |
| Bills receivable | 59,155 | 2,366 |
| Sundry amounts | 7,631 | 305 |
| Plant, carbonizing material, tools, &c. | 1,226,507 | 49,061 |
| | 27,704,694 | £1,108,188 |

Dr.—*Profit and Loss Account, Aug.* 31, 1878.

| | Francs. | Sterling. |
|---|---|---|
| To General expenses | 93,339 | £3,734 |
| Coupons, and difference between the issue and redemption prices of bonds | 621,754 | 24,870 |
| Bankers commission and interest, &c. | 18,349 | 734 |
| Sinking-fund for works of first establishment | 690,000 | 27,600 |
| Four per cent. added to reserve-fund | 25,235 | 1,010 |
| Dividend of 20 frs. per share | 467,100 | 18,684 |
| Balance carried forward | 3,509 | 140 |
| | 1,919,286 | £76,772 |

Cr.—*Profit and Loss Account.*

| | Francs. | Sterling. |
|---|---|---|
| By Balance on Sept. 1, 1877 | 4,998 | £200 |
| Profits on the year's working at the several stations of the Company | 1,914,288 | 76,572 |
| | 1,919,286 | £76,772 |

Accompanying the preceding report of the Board of Direction was the report of the Board of Supervision, which stated that the year's working up to the 31st August last allowed of the payment of a dividend of 20 frs. per share, which was equal to that of the previous year, but that the sinking-fund for works of first establishment exceeded that of the year 1876-77 by 200,000 frs.

The foregoing reports and accounts were received and adopted, and the retiring Directors re-elected.

## MAJOR DRESSER ON THE ELECTRIC LIGHT.

In the issue of the *American Gaslight Journal* for Dec. 16, Major Dresser, the Editor, writing on the subject of the electric light, says: "Our own views have not changed from those expressed in the report of investigations at Paris, published on the 16th of October;* and while many of the cleverest minds are at work at this problem, still much of the success talked about is only promised or hoped for. So much absurdity is printed upon this subject, that one is necessarily loth to say anything at present, but rather quietly wait for the development of facts, which, if we are not greatly mistaken, will go far to prove the truth of the old army adage—viz., 'It is not safe to believe anything you hear, and not more than half of what you see.' As an instance, we take a single case: A daily paper stated last week that Mr. Edison's 80-horse power engine would, when he had made his new dynamo machine, furnish 480 lights, equal to ordinary gaslights, at a cost of 1·95 dols. each per annum. Now, it is easy to determine the amount of coal ordinarily used to run an 80-horse engine 24 hours a day for 365 days. If the engine consumed 10 lbs. of coal per horse power per hour, it would require 3128 tons of coal to run it one year, and also engineers and firemen that would cost, in wages, about 10 dols. a day, so that the account would be simply, for fuel and enginemen—

| | Dollars. |
|---|---|
| 3128 tons of coal, at 4 dols. | 12,512 |
| 365 days wages, at 10 dols. | 3,650 |
| Total | 16,162 |

Dividing this by the number of lights, 480, gives the sum of 33·66 dols. per light per annum, with nothing allowed for electric machines, their attendance, &c. This calculation need not be continued to show the absurdity of the original newspaper story. Still, many 'believe everything they see in the papers,' and never stop to reflect whether there is reason in a statement or not. The electric light, in its own sphere, is a useful, powerful, brilliant illuminating agent; but it has not yet been either stored, distributed, or sold on a commercial basis for general purposes. Until that can be done, gas companies ought to increase their send-out yearly of a good honest 16-candle gas; see that it is properly burned; charge reasonable prices, and pay good dividends on a capital that is equal to anything like a fair valuation of their plant. Strict economy, good organization, and a strictly scientific procedure in their manufacture, is the proper way to enable them to compete with all sources of light except the sun."

## SHOREHAM AND DISTRICT WATER-WORKS COMPANY.

An Extraordinary General Meeting of this Company was held at Brighton, on Saturday, the 28th ult.—Dr. Fuller in the chair—for the purpose of considering and approving of a Provisional Order, for which application has been made to the Board of Trade, to empower the Company to raise additional capital, construct additional water-works, and supply water within the parishes of Lancing, Upper Beeding, Bramber, and Steyning.

The Secretary (Mr. T. Hardy) having read the notice convening the meeting,

The Chairman said that, although the word Aldrington was not in the notice, the particular business before the meeting that day was to approve of a Provisional Order to enable the Company to raise sufficient capital to supply that parish. They would remember that Aldrington was originally in their Act of Parliament, and that they obtained the necessary powers to supply it with water. Some short time since, the Brighton Corporation applied to Parliament for an Act to enable them to acquire the property of the Brighton Water-Works Company, and when they applied for that Act they scheduled Aldrington and Portslade. In consequence of this, they were threatened with opposition from the Shoreham Company, as Aldrington was already in their Act; but eventually an agreement was come to, by which the Corporation bound themselves never to come into the parish of Aldrington if the Shoreham Company did not come into Cliftonville. Although the Company had had this power, it had not yet been made use of, because there had been no houses to supply, it being merely an agricultural estate. Now, however, it had passed into the hands of four gentlemen, who intended utilizing it for building purposes. As long ago as March, when Mr. Hall was Chairman of the Company, he (Dr. Fuller) was deputed by the Directors to see the owners of that estate as to providing and laying on the water supply, and he obtained a sort of agreement from them on certain terms. He wished the meeting to understand that, although the Company had the absolute right, by their Act of Parliament, to supply the water there, yet they could not prevent the owners of the estate constructing their own water-works and supplying their own people. He thought, however, in carrying out such a scheme as that, the Aldrington owners would experience a great deal of difficulty. Since March, and up to the present time, several attempts had been made by the Directors to see if an arrangement could be come to by which they could supply the water; but the demands which the owners made appeared to be so extravagant, that the Directors could not agree to them. They also kept the Company till within two days of the time when the power would have been lost, and they would not have had time to apply for even a Provisional Order, which would have been necessary, as their capital was completely locked up in the works, and additional money would have been required for the purpose; and as the last meeting of the Directors and owners came to nothing, it was thought the best thing to do was to go to the Board of Trade, and ask for power to raise additional capital. Though up to within the last two days the owners denied that they intended applying for an Act of Parliament, still the Directors thought it desirable to obtain a Provisional Order, so that they might not be forestalled; and he considered it was very fortunate that that step was taken, because it was subsequently ascertained that the owners had applied for an Act, in the preamble of which they stated that their reason for applying was because the Shoreham Water-Works could not supply them, their funds being exhausted. By getting this Provisional Order they could oppose the owners obtaining an independent Act for their estate, because the Directors would be in a position to show that they could raise the money and lay down the necessary mains. As there would be no additional cost, other parishes—Lancing, Upper Beeding, and Bramber—were included. It was not the intention of the Directors to immediately supply these parishes, which had no water supply, but to have the power to do so if found necessary. Should the Shareholders confirm the steps which had been taken, the powers obtained would not be acted upon, except as the Directors from time to time saw they would be remunerative. Of course, if any of the money necessary to supply a place like Aldrington

* See Journal, Nov. 5, 1878, page 669.

were called up, the business could not be expected to be remunerative at first, and they would probably have to submit to a temporary diminution of dividend; but those Shareholders who did not approve of the extension would, he was sure, be able to realize the full value of their shares if they chose to sell. He concluded by moving—"That the said Provisional Order be and the same is hereby approved, subject to such alteration as the Directors may afterwards consider expedient, or the Board of Trade or Parliament may require."

Mr. R. H. PENNEY seconded the motion.

The SECRETARY then read the principal points in the Order.

Mr. W. D. SAVAGE said that there were one or two points which the Chairman had not adverted to, and which it seemed desirable to refer to. Whilst he was anxious, as far as possible, to avoid saying anything likely to give offence, he thought the Company were justified in adopting the course they had. He had heard it said the owners would come to no terms with them; but he thought they should say something on the other hand, why they (the Company) could not. And one of the important points was this, that if the Company had adopted one of the suggestions of the owners, that they should nominate four Directors, one of whom should be the Chairman, the Company to have only two, they would have parted with all the rights which they possessed from the Shareholders. The last proposition made to the owners he anticipated would have received a tangible reply, as it seemed to make an equitable arrangement between the two parties—it was, that the Company should supply them with water wholesale, and thus enable them to supply their customers. He thought this statement should be made, in justification of the course they had been forced to adopt.

The motion was put and carried, and a vote of thanks to the Chairman terminated the meeting.

## CITY OF POTSDAM WATER-WORKS.

As reported by the Directors at the Third Annual Meeting of Shareholders in the City of Potsdam Water-Works Company, Limited (see JOURNAL for Feb. 26, 1878, p. 311), these works have been satisfactorily completed. The following interesting description of them appeared in the *Engineer* of the 20th ult.:—

The city of Potsdam, which in December, 1875, contained 44,614 inhabitants, forming 10,400 families, and occupying 2153 houses, is situated to the south-west of Berlin, and has long suffered from the want of good water for household purposes. It is built on very low land, partly sand and partly swamp, on the north bank of the River Havel, many of the houses being built on piles 40 feet to 60 feet long; and the wells, all very shallow, yield very bad water. Although it had been for years acknowledged that water-works were a necessity, it was not till the autumn of 1874 that a concession was granted, which resulted in the formation of an English Company, for whom the works were designed and carried out by Mr. Henry J. Green, who was Engineer-in-Chief and Manager of the Potsdam Water-Works to the end of 1876, and to him we are indebted for the following particulars. This concession contained the conditions that the water should be cleansed by artificial or natural filtration, and delivered at a constant minimum pressure of 30 mètres above datum—about 90 feet above the street level, and considerably higher than any dwelling-house in the city—to every applicant, within certain specified limits. Although the city lies very low, there is a moderately elevated plateau at the north-west, which promised a good supply of water to deep wells sunk through the alluvium and clay to the coarse sand below, and, trial borings having confirmed this view, it was considered preferable to adopt natural filtration, especially as the only other source of supply—the River Havel—is often full of vegetation, and in summer too warm to be pleasant, while the North German temperature in winter is so low that the river freezes over, and open filter-beds would be rendered nearly useless. Lastly, the cost of keeping filters at work and in repair is comparatively great for small works, and in this case the cost of covered filters would have exceeded that of the wells as carried out.

In order to ensure a constant high-pressure supply, without constant pumping, during the years which might be expected to elapse before the greater part of the population should become consumers, and for obvious reasons, it was considered expedient to erect a storeage reservoir, of a capacity sufficient to contain several days supply. As it was a further condition of the concession that future extensions should be provided for, it was decided to erect buildings sufficiently large for future engines, &c., to secure land for more wells, and to make arrangements, at the reservoir or otherwise, for increasing the pressure head whenever this should become necessary.

The works comprise—(1) The pumping-station and wells; (2) the reservoir; and (3) the pipe system. The pumping-station is situated on a narrow strip of land, 300 yards long by 35 yards to 50 yards wide, between a road and a branch of the Havel, called the "Jungfern See," about 2½ miles from the centre of the city. The buildings are—a three-storeyed dwelling-house, with office; a coal store; the boiler-house, 42 feet by 40 feet, for four boilers, of which three are fixed; a tower, 45 feet high, for feed-pump; condensers and cold and hot cisterns; the chimney, 106 feet high, and the engine-house, 58 feet by 48 feet, only half of which is at present in use. The latter is founded on a 12-inch bed of concrete, paved with brick in cement 3 feet under the flood level of the river. The walls are carried up in cement to the level of the made ground forming the wharf. The engine-room floor is 10 feet above the paving in the basement; 12 inches of concrete is also laid under the whole of the boiler-house. The chimney foundation is laid in a caisson 18 feet square and 12 feet high, formed of 4-inch planks, well strengthened inside. This was sunk by spooning out the sand, and when nearly down to the water level, about 5 feet of concrete was put in through a shoot, in layers of 12 inches at a time. The concrete was made of 1½ Portland cement, 3 of coarse sand, and 4 of gravel and broken stone. When this had set, the water was pumped out, and the lower 8 feet carried up in coarse lime-stone rubble, the remainder up to flood level in clinkers, all in cement. The shaft is circular in section, tapering from 7 ft. 4 in. to 4 ft. 6 in. externally, and diminishing by offsets from 3 ft. 10 in. to 2 ft. 7 in. internally, stands on a pedestal about 10 feet square and 18 feet high. The upper half of the shaft was built without scaffolding. The chimney, as well as the engine-house and other buildings, is faced with light yellow and red bricks in an ornamental manner. The wharf wall is of timber—piles and 2-inch boards—400 yards long, filled up behind with sand, to 2·3 mètres above datum. The boilers are Lancashire pattern, 23 feet long, 5¾ feet diameter, with two flues, 1 ft. 9 in. diameter; each boiler has 510 square feet of heating surface. The two engines are duplicates, not connected, horizontal, condensing, with single cylinders 20 inches diameter and 36-inch stroke, fitted with Starke's self-acting expansion gear. The water to supply the Körting's patent condensers is raised by centrifugal pumps, driven off the main shaft. The boiler feed is taken by the donkey engine from the hot well, from the cold-water cistern, or from the town main. Giffard injectors are fitted as reserve boiler feeders. A double-acting horizontal plunger pump is fixed close behind each steam cylinder, the plunger, rod forming a continuation of the piston-rod. The plunger is 12 inches in diameter, and works in two barrels placed end to end; the four valves, two at each end of the pump-barrels, one above the other, together with the pump-barrels, are mounted on a large hollow casting, which serves as a vacuum vessel. The water rises from the 16-inch suction-main, below the engine-room, into the vacuum vessel, and through the lower valves alternately, flowing then through the upper valves into a pipe, which discharges into the air-vessel 17 feet high, 3 feet diameter, whence it passes down, through a stop, back into the town main. The air-vessel is supplied with air by a self-acting apparatus fixed to the nearest valve-casing. The pump-valves, which are of novel design, are mounted horizontally. Each valve consists of the seat and four rings, all in gun-metal, modelled to afford the least resistance to the flow of water; these are of different diameters, and when at rest lie one on the other, the cup-shaped smallest one at the top. The rings are fitted with peculiar stop-guides, which allow only a certain rise or play, so that when the water passes through the valves, the rings rise one after another, telescope fashion, and close in a similar manner, each of the rings forming a seat for the one above it, thus avoiding the concussion usually caused by the closing of high-pressure pump-valves. The seat is kept down by a rod passing through the valve-rings, and bolted to a cross-head above. With a head of 130 feet, and a plunger velocity of 2½ feet per second, no concussion is to be felt. The actual play of the valves can be observed through glazed eye-holes, fitted in the valve-chest. Each pump has a net capacity of 117·4 litres (26 gallons) per double stroke, and delivers, as measured in reservoirs, 112·9 litres, so that the loss for air, &c., is 4 per cent.

The water is taken from 14 tubular wells, sunk in a line parallel to the river bank, about 30 feet apart, in the following manner:—A cast-iron cylinder, 8 inches interior diameter, constructed of 6-feet lengths, with ends turned to fit flush into one another, and screwed together, was sunk in the usual manner to a depth of 40 feet below the original ground surface, which was just above the level of the river water; a wrought-iron 6-inch tube, put together in 6-feet lengths, flush outside, was then sunk in the cast-iron cylinder to a depth of 70 to 75 feet, and the sand carefully cleared out. The permanent suction-tube, 4 inches diameter, made of stout sheet copper with conical end, was then lowered, and soldered together in lengths as convenient (20 feet), till the lower end rested in the sand; the wrought-iron tube was then withdrawn, and the water pumped out by hand till it flowed clear. A copper hood or bend, containing a clack-valve was then bolted on, and a 4-inch sluice-cock fixed in place, both of which are enclosed in a brick chamber deep enough to take in the top of the cast-iron cylinder, the whole of which remains *in situ*, and is covered in with frame and planks at finished surface level. The bottom length of the suction-tube, 10 feet, with ½-inch holes, in rows ½ inch apart, between which 13 vertical hollow ribs, ½-inch high, are soldered on, so that in section this part of the tube resembles a toothed wheel. Three layers of brass wire gauze, about 1200 meshes to the square inch, are wound over the ribs, and soldered fast. The suction—or filter—area of each tube is thus about 11 square feet, and, as each tube yielded at a trial 6 litres per second, the yield per square foot per minute was about 7½ gallons. The water in the tubular wells, when at rest, stands 4 or 5 inches above the level of the river close at hand. The soil passed through consists of alluvium, running sand, a thin streak of clay, then better sand with fragments of lignite, another layer of clay, and, at 18 to 20 mètres depth, good sharp sand and fine gravel. In two instances granite boulders were met with, necessitating the boring of fresh holes. Behind the pumping-station, the ground rises to a height of about 50 feet, forming a plateau of sand and loam, which extends for some distance. Besides the tubular wells, there is one large brick well, with two concentric walls, outside diameter 14½ feet, built on a wrought-iron curb 3 feet high, 3 feet wide, and tied through from top to bottom; the lower 10 feet in perforated brick, the rest in stocks and cement. The space between the walls is filled in with clean gravel, sorted, and placed in vertical layers with the finest grain outside. There was great difficulty in getting this well down to 40 feet depth, and as the tubular wells were found to be more satisfactory in every respect, the proposed greater depth was not attempted; but two 6-inch copper tubes were sunk, in the manner above described, through the bottom of the well, to a total depth of 77 feet, and yielded a valuable increase to the supply as soon as the head in the large well was lowered by pumping. The Company's reserve land is sufficient for 20 more wells, and the suction-mains are laid so as to admit of future extensions in both directions, while sluice-valves are fixed to shut off the wells separately as well as in groups. The water from the tubular wells has a temperature of about 48° Fahr. in winter to 56° Fahr. in summer—taken from the air-vessel—and was analyzed by the Official Chemist in June, 1877, with the following result:—

1 cubic mètre = one million grammes = 1 ton of water, contains—

| | Grammes. |
|---|---|
| Carbonate of lime | 118·4 |
| Do. magnesia | 15·1 |
| Sulphate of potass | 6·1 |
| Do. soda | 7·6 |
| Do. lime | 64·1 |
| Chloride of sodium | 21·1 |
| Protoxide of iron | 1·2 |
| Silicic acid | 16·1 |
| Organic matter (peat) | 21·0 |
| Nitrogen (ammoniacal salts) | 1·3 |
| Nitrates | Traces. |
| Free carbonic acid | 28,000 c. c., or 2·8 per cent. of volume. |

No traces of sulphuretted hydrogen, hydrosulphate of ammonia, sulphuret of calcium, or nitrous salts were met with.

The river water was analyzed at the same time, and the result proved that there is no communication between the river and the wells.

The water is forced from the engine-house through about 1300 yards of 16-inch main to the reservoir on the Pfingstberg, at the foot of which is a branch of the same size leading off to the city. The reservoir is built half below and half above the natural surface and is 97 ft. 6 in. square internally, with 16 feet depth to overflow, divided by seven parallel 20-inch walls, with arched openings into eight vaults, arched in with two half-brick courses. The four external walls are 4 ft. 2 in. thick above the footings, reduced by offsets at the back to 2 feet at the full water-line. The footings are all laid on 12 inches of stiff clay puddle, mixed with one-third broken stone, the spaces between the footing being filled in with the same thickness of puddle and 12 inches of concrete, over which is laid a course of hard-burnt brick in cement, then ¾-inch of asphalte, and the bottom finished off with another course of brick in cement. The external walls are backed up to water-line with 12 inches of puddle. The whole of the brickwork is laid in cement. The arches and backing are covered with ½-inch of asphalte and 3 ft. 3 in. of earth; the slopes finished off 1½ to 1, and the whole surface sown with grass. One ventilator is built into each arch, and carried up 2 feet above the surface. At one corner there is a door, opening on to a small platform, over the water, under which there is a float, and where the electro-magnetic telegraph apparatus is fixed, which, by means of two wires laid down to the pumping-station, continually shows in the engine-room the actual height of water in the reservoir. In front of the reservoir there is a valve-chamber, 16 feet by 10 feet, and over this an ornamental tower, 10 feet square and 50 feet high, above the bottom of the reservoir, containing the stand-pipe, the bend of which is only 39·6 mètres (126 feet) above datum, the level of

full water-line, but it can be raised 50 feet if more pressure should be required. The water passes up the 16-in. main over this bend of the stand-pipe, between the two legs of which a back-stop valve is fixed. This is constructed so as to admit of being raised like a sluice-valve, in order that the stand-pipe may be put out of action when required, and the valve itself easily repaired by taking it out through the top, after removing the cover, without interruption to the flow of water in or out of the reservoir. Behind the stand-pipe there is a 16-inch branch into the waste-pipe, which lies parallel to it, with a sluice-valve between the two mains. Beyond the branch is a sluice-valve on the pressure-main, which passes through the wall of the reservoir on a level with the paved bottom. The overflow-pipe, 3 feet wide at the top, is laid through the front wall over the pressure-main, and, passing down through the valve-chamber, ends in the river below. By means of the arrangement above described, the reservoir can be conveniently emptied, shut off, and cleaned, without stopping the pressure supply to the city; while, on the other hand, the net cubic contents, 4188 cubic mètres or 922,500 gallons, is more than ten days supply at the present rate of consumption, and renders continuous pumping unnecessary. A drain-pipe from the floor of the valve-chamber is taken into the overflow-main at a lower point outside the reservoir enclosure, so that in case of leakage the chamber will still remain dry.

The pipe system commences at the 16-inch branch on the main laid from the pumping-station to the reservoir, at which point there is a casting, with three branches at equal angles, and on each branch a sluice-cock. When the engines are at work, these three cocks being open, the water required for the town flows direct thither, the surplus going over the stand-pipe into the reservoir, and remaining there till the engines cease working, when, the head in the stand-pipe being taken off, the water flows out of the reservoir through the back-stop into the town. By closing the proper valve the water can be pumped at any pressure direct into the town without using the reservoir, or the connection with the pumping-station may be cut off, and the town supplied only from the reservoir, or the latter may be filled while the main to the town is put out of action, in which case the city can be supplied through a 5-inch distribution-pipe, which is branched off the reservoir main just above the sluice-valve during the time, and is in connection with the whole of the pipe system. The principal main is about three English miles long, and passes through the centre of the city, with a diameter of 16 inches; thence it is reduced successively to 12, 11, 10, and 8 inches at the river bank, and is fitted with the requisite self-acting air-cocks and branches, with sluice-cocks to allow of emptying. Branches, varying in size from 8 to 4 inches, are taken off at various points, and circulation-mains are laid as near as practicable to the periphery of the city, with the view of equalizing the pressure in the mains, and to facilitate future extensions towards the suburbs. These circulation-mains are also partly used for the same purpose as the distribution-pipes, which are from 6 to 3 inches in diameter, and frequently connected at the ends of streets, so as to avoid dead ends as much as possible. The mains pass under water channels at three points—(1) at the city canal, where a 12-inch boiler-plate syphon, 61 feet long, is laid behind the quay walls, and across under the bottom; (2) at the Lang Bridge, where an 8-inch pipe, 710 feet long, takes the water under both arms of the River Havel to the railway and neighbouring suburb; and (3) at Behlert's Bridge, where a similar pipe, 100 feet long, crosses a swampy branch of the Heiliger See. The total length of the pipe system—excluding suction-pipes—is 34,613 mètres, or 21½ English miles, including 4346 mètres—2¾ miles—of 16-inch main. Fifty-eight sluice-cocks serve to shut off the branches, and 261 hydrants are fixed under the roadways, at intervals of about 100 yards. Since the completion of the works in 1876 several extensions have been carried out, for which provision was made in the original plan; but these are not included in the above figures. By feet and inches are to be understood old German measure, about 3 per cent. longer than the English standard. The pipes are asphalted inside and out, and cast 3 mètres long, net, with the exception of the 16-inch pipes, which are 4 mètres in length; they are laid 5 feet deep, and weigh—

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Diam. millim. . | 400 | 300 | 275 | 250 | 200 | 150 | 125 | 100 | 75 | |
| ,, inch . . | 16 | 12 | 11 | 10 | 8 | 6 | 5 | 4 | 3 | (old German) |
| Weight kilos . | 140 | 100 | 85 | 77 | 57 | 39 | 32 | 24·5 | 17·5 | per mètre } as laid. |
| ,, lb.(Engl.) | 240 | 170 | 146 | 132 | 97 | 66 | 54 | 42·0 | 32·5 | per yard } |

The first pipe was laid on the 31st of March, the foundation stone in the reservoir on July 21, 1875. The extraordinary floods and the long severe winter of 1875-76, together with other circumstances not under the control of the Engineer, caused a delay in the progress of the works of at least 13 weeks longer than would have been the case in a normal season, and without extraneous interruption; nevertheless, the works were completed and in action on Aug. 25, 1876, the clear working time having been 13 months. These works, alike in design, execution, and performance, reflect very great credit on Mr. Green.

## ON SOME IMPROVED METHODS OF PRODUCING AND REGULATING ELECTRIC LIGHT.

By Mr. Henry Wilde.

[A Paper read before the Manchester Literary and Philosophical Society, Nov. 26, 1878.]

In a former communication to the Society,* I directed attention to the fact that when the electric light is produced from the ends of two carbon pencils placed parallel to each other, if the strength of the electric current, the thickness of the carbons, and the distance between them are rightly proportioned, the carbons will burn steadily downwards, until they are wholly consumed, without any insulating material between them. To initiate the light by this method, it is necessary to complete the electric circuit between the carbons by means of some conducting substance, which volatilizes on the passage of the current, and establishes the electric arc between the points.

When a number of lights are produced simultaneously from the same source of electricity, any interruption in the continuity of the current extinguishes all the lights in the same circuit, and each pair of carbons will require to be re-primed before the lights can again be established. This defect, as will be obvious, would cause great inconvenience when the lights are not easily accessible, or are at considerable distances apart.

In the course of my experiments it was observed that when the electric circuit was completed at the bottom of a pair of carbons close to the holders, the arc immediately ascended to the points, where it remained so long as the current was transmitted. My first impression of this peculiar action of the arc was, that it was due to the ascending current of hot air by which it was surrounded. This, however, was found not to be the cause, as the arc travelled towards the points in whatever position the carbons were placed, whether horizontally or vertically in an inverted position. Moreover, when a pair of carbons was held in the middle of the holders, the arc travelled upwards or downwards towards the points, according as the circuit was established above or below the holders. The action was, in fact, recognized to be the same as that which determines the propagation of an electric current through two rectilinear and parallel conductors submerged in contact with the terrestrial bed, which was described by me in the *Philosophical Magazine*, August, 1868.

In all the arrangements in general use for regulating the electric light, the carbon pencils are placed in the same straight line, and end to end. When the light is required, the ends are brought into momentary contact, and are then separated a short distance to enable the arc to form between them. The peculiar behaviour of the electric arc when the carbons are placed parallel to each other, suggested to me the means of lighting the carbons automatically, notwithstanding the fact that they could only be made to approach each other by a motion laterally, and to come into contact at their adjacent sides. To accomplish this object one of the carbon-holders is articulated or hinged to a small base-plate of cast iron, which is so constructed as to become an electro-magnet when coiled with a few turns of insulated wire. The carbon-holder is made in the form of a right-angled lever, to the short horizontal limb of which is fixed an armature placed over the poles of the electro-magnet. When the moveable and fixed carbon-holders are brought into juxtaposition, and the carbons inserted in them, the upper parts of the two carbons are always in contact when no current is transmitted through them.

The contact between the carbons is maintained by means of an antagonistic spring, inserted in a recess in one of the poles of the electro-magnet, and re-acting on the under side of the armature. One extremity of the coil of the electro-magnet is in metallic connection with the base of the carbon-holder, while the other extremity of the coil is in connection with the terminal screw at the base of the instrument from which it is insulated. The coils of the electro-magnet are thus placed in the same circuit as the carbon pencils.

When the alternating current from an electro-magnetic induction machine is transmitted through the carbons, the electro-magnet attracts the armature, and separates the upper ends of the carbons, which brings them into their normal position, and the light is immediately produced. When the circuit is interrupted the armature is released, the upper ends of the carbons come into contact, and the light is produced as before. When several pairs of carbons are placed in the same circuit, they are, by this arrangement, lighted simultaneously.

* See Journal, Dec. 24, 1878, p. 930.

## THE PRICE OF GAS AT ROCHDALE.

At the Ordinary Monthly Meeting of the Rochdale Town Council, last Thursday—the Mayor (Mr. W. J. Petrie) presiding—the minutes, which were presented from the Gas Committee, showed that the Committee had rescinded the resolution which they submitted to the Council last month for a reduction in the price of gas, and which resolution the Council referred back to them for further consideration.

The Mayor, in moving the adoption of the minutes, said a word of explanation might be required on the matter. It would be remembered that the Gas Committee made a proposal, at the last meeting of the Council, to reduce the price of gas, and the Council, feeling that they required more time for the consideration of the subject, referred it back to the Committee for reconsideration. Some discussion took place at the time in the Council, and he thought each speaker expressed himself pretty strongly against the scheme of lowering the price. The Committee, therefore, desirous of obeying the will of the Council, rescinded the resolution. He hoped the Council would appreciate the readiness on the part of the Committee to accede to their wishes, especially when to do so was not very hurtful to their own feelings.

Alderman Littlewood did not think the reasons which the Mayor had just given were sufficient to account for the Committee rescinding their resolution, if, when they passed that resolution, they really thought such a course was desirable. He did not know that the gentlemen who spoke at the last meeting of the Council expressed the feelings of a majority of the Council, for there was no vote taken on the point. He should be glad to hear the Mayor give some other and independent reasons why it was not desirable to reduce the price of gas, and some information as to whether, if pressure were brought to bear upon the Committee to reduce the price, they would be inclined to do so.

The Mayor said that, if there were any better reasons for rescinding the resolution, he could not give them. To rescind the resolution was against his own views; but a majority of the Committee thought otherwise, and, perhaps, some of the gentlemen who voted with the majority in the Committee would be willing to give those better reasons which Alderman Littlewood required.

Mr. Fishwick remarked that, as far as he understood it, the feeling at the last Council meeting was not against a reduction in the price of gas. He did not gather the spirit of the speakers to be that, but simply that the Committee should give fuller details of the reasons which had led them to propose the reduction than they seemed at the time prepared to give, and also to allow the Council a better opportunity of considering the proposal. The Committee, by rescinding the resolution, appeared to have caught at the slightest opportunity of an excuse to withdraw from what they felt it to be their duty to do. For his part, he regretted the rescinding of the resolution, for if the Committee saw their way to reduce the price of gas, he felt they ought to do it, irrespective of anything said in the council-room to the contrary.

Alderman Shawcross thought the feeling of the Council at the last meeting was this, that before they sacrificed such a source of revenue as they would do by reducing the price of gas, they ought to have some further information on the subject. If the price charged was excessive, it ought to be reduced. But it was not excessive, and the mere fact of their making a large profit, which went to swell the finances of the town, ought not to be any reason for reducing the price below what was fair and reasonable. If they could get a revenue from that source, it was quite as fair to do so, providing the price charged was not excessive, as by levying rates; and he thought it would need much consideration on the part of the Council before they sanctioned such a step as that proposed a month ago. He supposed the real truth of the matter was that the Gas Committee were pretty equally divided on the question, and when they saw what the feeling of the Council was, they thought it wise to abandon the proposal.

The Mayor: There were only two of us in favour of bringing it again before the Council.

Mr. Johnson thought that this was the first time in his experience that the Council had refused to accede to a proposition on the part of the Committee to reduce the price of gas. As to whether the present price was excessive, he thought the only criterion on that point was the rate charged in other towns; and, judged by that standard, the price in Rochdale certainly was excessive—in fact, the charges were the highest he knew of for a town of similar magnitude in that part of the country, or indeed in any other. When Alderman Shawcross spoke of it not being wise to give up this source of revenue, he thought that he lost sight of the very important fact that the gas consumers of Rochdale were not all of them in the same position as the large ratepayers. For instance, a millowner who was a large consumer of gas got it at a very greatly reduced price. If gas were charged at the rate the Committee proposed at the last meeting, such an one would no doubt save a certain amount by the reduction; but, on the other hand, if the gas profits, as a source of revenue to the town, were reduced, the deficiency would have to be met by direct rating, which would more than counterbalance the saving which he would make by the reduction in the price of gas. Or, to take another case, the owner of a large warehouse. His gas bill would not

be large, and probably a reduction in the price, as proposed, would not make a greater difference than 5s. a year. But the extra rates that would have to be imposed in lieu of the reduction would amount to much more than that sum, for it must be remembered that the gas profits were equal to what a rate of 7d. or 8d. in the pound would bring in. He thought, therefore, it was very wrong to charge a higher price for gas than necessary, just to raise a revenue from it, simply because the money was not paid in the same equal way as rates were. Alderman Littlewood had, in previous discussions, attached importance to the point whether the profits derived from the gas-works were greater than a fair per centage upon the capital employed. But he must know that the whole of the capital was borrowed money; and before the profits referred to were declared, the interest on that borrowed money had first been paid. The profit declared was really the amount of money the concern was making after paying all those expenses. It would be a very different thing, supposing the concern belonged to a private company, who would possess the whole capital invested in it, because he thought he remembered Alderman Simpson saying a few years ago, when the profits were something like what they were at present, that they were making 9½ or 10 per cent. If that were so, then the profit was excessive, especially when they considered that the article manufactured was one which conduced largely to the comfort of the inhabitants. If any rise in coal took place, or other extraordinary circumstances arose, the Committee could come at any time—as they had done on previous occasions, even in the middle of a quarter—and ask for the price of gas to be raised. He contended that it was impolitic on the part of the Corporation to be charging a higher price than even private companies were doing. Looking at the matter simply as one of revenue, he regarded it merely as an indirect mode of taxation; and they had the authority of a gentleman whose judgment many would not question—Mr. John Bright—who had spoken of the income-tax as being far preferable to indirect taxation, because where the money was raised by indirect taxation, the people did not take the same interest in the spending of it as when it was raised in a more direct way. If, as no doubt was the case, they were getting, in the shape of profits from the gas-works, what was equal to a rate of 8d. or 9d. in the pound, that was nothing but an indirect tax, and one of which he thought the generality of the ratepayers were not aware. The proper course to pursue would be to look the matter fairly in the face, and rate directly for all the money they required.

Alderman Littlewood said the remarks which had been made simply confirmed him in the impression that what the Council wanted at the last meeting was more information on the matter, rather than to express a direct opinion that no reduction should take place in the price of gas. It was needful that some consideration should be given to the subject before they voted for the reduction. He quite agreed with Mr. Johnson that any excessive price charged for gas was undesirable, because it amounted to an indirect tax, and was an unhealthy way of raising the revenue of the borough. They had no right to get a greater profit out of the works than a fair and remunerative return upon the money invested. He regarded it that, in the matter of the water-works and the gas-works, the Corporation were just in the position of ordinary traders—that they sold to themselves, and that on those two undertakings they were perfectly justified in getting a fair and equitable profit. The reason he wanted further information was to enable him to judge whether at the present time, and with the present prices, they were getting more than that reasonable profit. If that were found to be the case, he should vote for a reduction in price, believing, as he did, that anything required in the way of taxation should be raised directly, if possible. Mr. Johnson was entirely wrong in his statement as to the millowners. He (Alderman Littlewood) once took the trouble to calculate in several sample cases, comprising various kinds of property, how they would be affected if they paid a certain sum on the one hand, through the rates, or, on the other, through the gas profits; and he found that, in the case of mill property, it made little or no difference to the proprietors whether they paid through their gas bills or as a direct rate. But in the case of warehouses there certainly was a difference, and it was much better for the owners to pay more for the little gas used, than have to pay an extra rate. On the other hand, in the case of a shopkeeper, he would save money by the price of the gas being lowered. Lastly, in the case of a private dwelling-house, the difference would be little or nothing. They might, therefore, discard at once any idea of millowners advocating a rise or fall in the price of gas, because of its effect upon themselves individually. All he wanted was for the Committee to give them such information as would put them in a position to judge whether, with the present low price of material, they would be justified in making such a reduction in the price of gas as would still leave them with a fair and remunerative profit. He reminded them that, in judging of the relative price of gas in Rochdale, compared with other towns, the element of quality had to be taken into consideration, for they might get gas at a cheap rate, and yet really be paying a high price for it.

Alderman Taylor thought it would be a lamentable thing if they were to go upon the principle of making no profit from the gas-works, although, considered as an abstract question, that position might be well defended. Rochdale, however, had always gone on the other principle, but he did not think, taking the works from the first, that the profit had exceeded 5 per cent. He did not think that profit ought to be reckoned until after the interest had been paid, and the depreciation allowed for. In the latter respect, he did not think the Committee were allowing a sufficient sum for depreciation. For the first few years, after the works came into the hands of the Corporation, a certain sum was set aside for depreciation, which had accumulated to £8000 or £10,000 before the principle was—unwisely, he thought—changed. If, after allowing interest on the capital, and setting aside a certain portion for depreciation, the net profits exceeded 5 per cent., then he thought it would be prudent to reduce the charge. He quite agreed with the principle of direct taxation in all things, so far as it could be prudently adopted; but he thought Mr. Johnson had slightly misrepresented the opinion of Mr. Bright on the point. He could not imagine Mr. Bright declaring that the income-tax was the best tax, though he could quite imagine him expressing an opinion in favour of the revenue being raised by a property-tax, which would be a very good thing. Reverting to the fact that the Gas Committee allowed nothing for depreciation, except paying a 75th part of the debt off, he remarked that if in 30 years the electric light had come into general use for certain purposes, their gas property would have depreciated much more than an amount represented by the repayment of the debt. On those grounds he advocated a greater allowance for depreciation, and then, when the profits exceeded 5 per cent., he should be quite prepared to reduce the price.

Alderman Tweedale said that, though a member of the Gas Committee, he was not present when the motion rescinding the resolution was passed, and he thought it was a great mistake. He thought the Council and the Committee should consider this—that it was not unlikely, before long, that the electric light might come into use for large buildings; and the policy of the Committee ought to be, by reducing the price of gas, to keep that competition away. The amount of money sunk in the gas-works was so great that they did not begin to realize a profit until the consumption reached about 180 million feet; but over that quantity their profit was considerable, and he was satisfied that, by lowering the price, they could not only prevent competition, but also, by the greater quantity they would sell, make a better profit than they did at present. In considering their present profits, they must bear in mind that the consumption of gas had fallen off for the last two years, and he had no doubt that, if trade revived this year, and the mills began to use the amount they had been accustomed to do, the profits next year would show an excess of £3000 or £4000, seeing that one very million feet sold above 180 millions, they made a clear profit of about £150. After expressing the opinion that the large consumers would benefit most by the reduction, and the small householders least—notwithstanding what Alderman Littlewood had stated—he went on to say that, in his opinion, the Council could very well afford to reduce the price of gas, and he was very much surprised that the resolution, passed nearly unanimously by the Committee, had been rescinded by them. Gas was probably the cheapest mode of heating that householders could have, and if by reducing the price they could conduce to its being more generally used for domestic purposes, such as for cooking, &c., the consumption would considerably increase, especially in the summer time, when, owing to the fixed charges on the gas-works, and the small amount of gas used, it was sold almost at a loss. For himself, he was decidedly opposed to keeping gas at its present price.

Alderman Simpson did not apprehend that they would come to a division on the subject, because there was no motion before them in reference to the price of gas, and he thought the only question the Council had to consider was the propriety of the Committee again considering the resolution referred back to them a month ago. He would mention two or three points which, to his mind, rendered it desirable that they should keep the price of gas as it was at present. In the first place, as had been stated by Alderman Tweedale, there was a large falling off in the consumption, and it did not greatly exceed that minimum below which they could not make at a profit. Their profits, therefore, notwithstanding the low price of coal and cannel, would be nothing like so large as if trade had been running in its usual channel. He thought these were cogent reasons why they should wait until the end of the current municipal year in March, and see what their position was then. In reference to the arguments made use of as to the price of gas, he thought that the position they occupied in comparison with other towns ought to be considered in the light of the various circumstances affecting them; and in comparing prices merely, without taking into account the circumstances under which the gas was being manufactured, and the way in which the makers had previously appropriated their profits, they were very likely to draw conclusions which were not really justified by the premises. For instance, in Rochdale, all the surplus gas profits had been handed over to the Finance Committee, for the improvement of the town; but in some towns, only a portion of the profits had been so appropriated, the remainder having gone to reduce the capital. In some works of similar dimensions, the capital account stood at only about half the amount it did in Rochdale, and therefore they were able to sell the gas at a cheaper rate. The electric light had been referred to. There was no doubt the public mind was in a state of suspense as to whether that light would be successful to such an extent as to supersede gas. If it did succeed, what would be their position in relation to the gas-works and the capital invested? That was one reason why they should hesitate; but it also worked in another direction. If trade were good, and the outside districts thought they were being charged too much for their gas, attempts would, no doubt, be made to establish private companies to supply them; but at a time when there was such an unsettled feeling in the public mind in relation to such companies, and their shares were so much depreciated in value, it was not likely that new ones could be formed. The unsettled feeling to which he had referred showed that some people imagined that their property in gas-works was insecure, and if there was any foundation for that, it meant that the property of the Corporation was also insecure, and required protecting, for the present at any rate. Mr. Johnson said the Committee were charging a higher price than some private companies. There was a very good reason why they should do so. The profits made by the Committee went to the improvement of the town; the profits of private companies went into the pockets of the shareholders. They were not taxing the ratepayers for any private interest; the profits all went to the general welfare of the town. There was another reason which they must consider. They said that the gas profits were equal to a rate of 7d. or 8d. in the pound; but they must bear in mind that the area of supply extended much beyond the borough, and if they raised the price of gas, they were debarring themselves from a source of revenue which they derived from outside the borough, and to make up for which they would have to rate entirely inside the borough. For those reasons, he thought it would be very unwise, at the present time, to interfere with the price of gas.

Alderman Baron said he was the person who proposed the rescinding of the resolution in the Gas Committee, and he would endeavour to give a reason for the faith that was in him. He would like the Council to understand that they had 16,000 or 17,000 gas consumers, and out of that number there were something like 6000 who did not burn more than 2000 feet of gas a year—that was about 2s. worth a quarter. He had gone through the books, and found there were a great number of consumers whose quarter's rental did not exceed 5d., and the number was vastly increased if they went up to 10d., these sums representing a consumption of 100 and 200 feet respectively. He would like any member of the Council to point out where the profit was in these cases, when the inspector had to go twice, make two entries in his book, bring them to the office, have the entries posted and cast up, accounts made out, money gone for, money brought in, a receipt given, entered in the cash-book, and posted in the gas-rental book. Where was the profit when they received 5d. or 10d. for doing all that? It was an absolute loss, and as the guardians of the interests of all the ratepayers, and expected to deal justly between them, how could the Council ask the large consumers to pay for the small consumers, as they undoubtedly did in these cases? He believed there was an absolute loss on the whole of the 6000 persons who burnt less than 2000 feet a year, and, therefore, he could not vote for any reduction in the price charged to them. He thought the argument a very fallacious one, which reckoned upon an increased consumption as a result of a reduction in the price. The reduction proposed would, on those who burnt 2000 feet a year, amount to a saving of about a penny per month, and who would be hardy enough to say that any one would burn more gas in consequence of this? or, even in the case of those to whom the reduction would be of more consequence, which of them would have the gas wasted in his house? The fact was that they would burn neither more nor less because the price might be reduced. As regarded the millowners, of whom mention had been made, he found, on going through the books, that some of them would be losers and some gainers by a reduction in the price. Why, then, should they interfere with that source of revenue—which nobody had complained about—with respect to which no pressure of any kind had been brought to bear upon the Gas Committee? or why should they rob themselves of a revenue which could not be more equitably distributed? He reminded them that the circumstances in Rochdale were exceptional. Their capital account for the gas-works stood at about £180,000, on which

interest had to be paid before profit could be reckoned; and, taking this into account, he did not think the amount of profit realized was excessive. In Manchester, the profits had been over £100,000 in one year, and, supposing that Manchester were four times the size of Rochdale, that would allow, on the same principle, a profit in the latter place of £25,000. But they did not propose to make a profit of anything like half that amount. He would remind them that the debt upon the town was now £1,186,000, and it was likely to be very much increased. Under these circumstances, he thought that to do away with a source of revenue which no one had complained about was to commit suicide upon their own interests. In conclusion, he urged that, even supposing it was desirable to reduce the price, why not leave it until the end of the financial year, when the realized profits would be known, and would form a guide as to the amount of the reduction?

Mr. JOHNSON moved, as an amendment—"That the minutes be confirmed, with the exception of the minute repealing the former resolution as to the reduction of the price of gas."

Alderman TWEEDALE seconded the amendment.

Mr. MILNE said he believed he was the member who moved, in the first instance, that the price of gas should be reduced; and, notwithstanding what had been said in the Council, the Committee had had sufficient reasons for taking the matter up. There was considerable pressure brought to bear upon the Committee, who decided to be guided by the opinion expressed in the Council. The question was discussed a month ago, and the Committee felt that they had not, at that time, the support of the Council. The Committee had re-considered the question, and there were two or three reasons why they decided to rescind their former resolution. One was the opinion expressed by the Council, almost unanimously, and another was the information brought by one member of the Committee, of which the Gas Committee were not in possession previously. If the present amendment were passed, the Committee would take up the question again, and deal with it as they thought best. They had no very strong personal feeling in the matter, but were prepared to carry out the wishes of the Council. He certainly was not aware, previously to the intimation which had been brought before them, that there were so many small consumers, who, as Alderman Shawcross had put it, would be unprofitable if the Council could make the gas for nothing, because the cost for inspection, collection, &c., was more than was paid for the gas altogether.

Mr. ROBINSON thought, before they voted upon the amendment, it would be wise to understand its full purport. If he read it aright, if the amendment were carried, it did not mean referring the matter back to the Committee, but it meant adopting the resolution brought before the Council last month.

After some further discussion,

The MAYOR, in replying, said he thought it only natural that the Council should express some surprise at the rescinding of the resolution. Astonishment had been repeatedly expressed that the Gas Committee should wish to interfere with the gas revenue. But in making a proposal to reduce the price of gas, they did not believe they were interfering with the revenue. They believed that the less price they were now paying for the coal, and the somewhat more economical management at the gas-works, would enable them to finish the year with such profits as they had last year. Therefore, they thought they were perfectly right in reducing the price of gas, if they could do it under those conditions. It was true that this calculation was founded upon estimates which, in consequence of the great depression in trade, might not turn out quite correct. He thought it well that the consideration of the question should be left until the termination of the financial year, and for that reason he was not in favour of the amendment; but he would promise the Council that he would bring the matter before the Committee again for further consideration before the end of the present quarter. The remarks which had been made by some gentlemen, with regard to the classes of consumers who paid profits, were founded upon false figures. The proportion of small consumers—those who consumed under 5000 feet per annum—was remarkably large; it was just about 60 per cent. of the whole number of consumers. The wages they paid for inspection alone amounted to £560 per annum. That sum, upon the small consumers, would amount to 8d. each per annum. If they doubled that for other office expenses, it only amounted to 1s. 4d. each consumer, for collecting the accounts, &c. So that if they took these small consumers at an average of 10s. per year, this was a cost, for office work alone, of 1s. 4d. on 10s.

Mr. JOHNSON: Can you give us the total number of consumers, and the total cost of inspecting meters?

The MAYOR: The total number is 16,578, and the cost of inspection £560. Of course, the cost of small consumers is according to the amount of revenue which they bring in. But this question of the distribution of charges between one class of consumers and another is quite a different matter, and I think it must be left for further consideration.

The votes were then taken, when only two or three hands were held up for the amendment, and the minutes, as read, were approved.

## THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The continued good demand for the better classes of round coal suitable for house-fire purposes has induced a firmer tone for this description of fuel, and there has been a slight recovery from the low prices which have been ruling during the summer months, notices having been issued from some of the collieries in the South-West Lancashire districts of an advance in prices ranging from 6d. to 1s. per ton. There is, however, no general advance, as at those pits where list rates have been adhered to, there is no alteration in the quotations. For house-fire classes of fuel, the average prices at the pit mouth now range about 9s. 6d. to 10s. for best Wigan Arley; 7s. to 8s. for second qualities; 7s. to 7s. 6d. for Pemberton four-feet; and 6s. to 6s. 6d. for common house coal. In other descriptions of fuel there is no change. For the inferior classes of round coal there is still very little demand, as the requirements for iron-making purposes are at present extremely small, and engine fuel continues very difficult to move, in consequence of the depression in the cotton trade, burgy and slack both being pushed in the market at very low figures. Common coal, for steam and forge purposes, is quoted at from 5s. to 5s. 6d. per ton at the pit mouth; burgy at from 4s. to 4s. 6d. per ton; and slack at from 2s. to 3s. per ton.

In the shipping trade there is rather more business doing, and prices are without material change, except that there is not so much pushing at the very low prices which have recently been ruling in the market.

As most of the iron-works are at present closed for the holidays and stock-taking, there is little or nothing doing in this branch of business, and prices are nominally the same as last week. Merchants are pushing a good deal of iron in the market, for delivery over the whole of next year, but there are very few buyers.

In the engineering branches of trade there is a very unsettled feeling, in consequence of the threatened action of the masters to revert to the old hours of labour, and there is every probability of a severe struggle between employers and employed.

## THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The contracts for the supply of coals to the leading gas-works are being made. Most of them will run for twelve months. They will be completed about the middle of January. There is a reduction of from 3d. to 6d. per ton upon the contracts made in the early part of last year. This will apply to the best quality of coals; but it is pretty clear that some of the second-class collieries, if they have entered upon contracts, will have had to do so at a shade less money than the above-quoted figures. The shipments of gas coal over the year from the Durham district have been quite as good as in preceding years. It is a cheap coal, and, in all probability, so long as the present price is obtained, it will keep a leading position in the market. Sea-borne coals now present considerable advantages over inland coal, especially gas. The rate for carrying a ton of coals by railway is a fixed charge, whereas sea borne coal has the command of a great amount of tonnage, steam and sailing, as is the case at present, when the shipping trade is depressed, and freights are low. About three weeks ago, steam freights to London got up to 5s. 6d. per ton. They have fallen to 4s. 6d. per ton, and there has been a reduction of from 6d. to 9d. per ton on freights for coasting sailing vessels. Gas coals have been carried to London by steamer over 1878 at, so far as can be averaged, about 4s. 4½d., certainly not more than 4s. 6d. per ton; sailing ships, to deliver at the wharves, at from 5s. 3d. to 5s. 6d. per ton. Freights have been equally low to other parts of the coast. A question may be asked—Do these low rates pay? They do not pay sailing ships, it is pretty certain. But it is understood that the figures I have quoted return the owners of steamers a reasonable profit. Most of the leading gas collieries have boats of their own, and, as I stated last week, some steamers which have been built to carry gas coals above the London bridges answer their purpose admirably. Other classes of coals wrought by the pits in the North of England are low in price, and it is not at all probable, without there is a very extraordinary reaction and improvement in the iron and other manufacturing trades in the North of England, that any considerable advance will be established upon them in 1879. The cause of the great rise in the value of coals four or five years ago was the enormous demand there was for them for manufacturing purposes. Even if there were a fair improvement in manufacturing business, so many pits were sunk to produce second-class coals in the prosperous times, and their output is constantly being forced into the market, that the rise in coals could only be counted by sixpences and shillings. The days of sudden jumps are over.

There has been an abundance of tonnage in the market for coasting purposes, and, though a good few sailing ships came freighted, the market has been in favour of the shipper. It is likely to continue so over January. Some steamers and sailing ships have been engaged to carry gas coals to the North of France, and there have been inquiries for vessels to load gas coals to some of the Irish ports. The quotations at present for steamers are, per ton—London, 4s. 6d.; Dublin, 6s. 6d. Havre, 6s.; Bordeaux, 7s.

The general manufacturing trade of the North of England is unchanged, but business looks a little brighter and more hopeful for 1879. There is a prospect of a better trade in chemicals to the United States. The German manufacturers of iron, and, indeed, all kinds of goods, are competing pretty keenly with British trade.

The shipments of coals, mainly gas, from the Tyne Dock in 1878 was only about 3 per cent. below 1877.

## TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

At the half-yearly meeting of the Directors of the Wigtown Gas Company, held last week, it was resolved that, considering the favourable state of the Company's funds, they would reduce the price of gas to 10d. per 1000 cubic feet from the 26th of November last.

In the minutes submitted to the usual monthly meeting of the Town Council of Glasgow, last Thursday, there was a report, from the Sub-Committee on Contracts, in connection with the Gas Committee, dealing with the mode in which the contracts for gas coal were considered. It stated that, during the last two years, the Sub-Committee had found considerable difficulty in buying third-class coals; with first and second qualities they had had less trouble. In 1875-76, as well as in 1876-77, the prices for third-class coals were very moderate, and no difficulty whatever was experienced in effecting purchases for these years. In 1877, however, on the opening of the tenders, it was found that, though wages were considerably lower, a large advance was asked on third-class coals, while first qualities were offered at about the average price of previous years. In these circumstances, the Sub-Committee shrank from at once paying this large advance. An effort was accordingly made to break down what appeared to them to be an unwarranted increase in price. The result was that, although higher rates had to be paid, an important reduction was effected on the prices of both second and third class qualities. In the year now current, first and second class coals were offered at an important reduction on last year's rates, and certain of these offers were at once accepted. The tenders for third-class coals, however, again showed such an increase on the high prices of last year as induced the Sub-Committee to instruct the Secretary to submit a reduced offer for an important quantity at last year's price, which was accepted. New tenders at reduced prices were subsequently sent in to the Sub-Committee, and were accepted. Thus the necessary supplies of the current year were completed. The working results of the last five years are as follow:—In 1873-74 the yield of gas per ton of coals was 8553 feet, and the price of gas was 4s. 7d. to 5s. 5d. In 1874-75 the yield of gas per ton of coals was 9383 feet, and the price of gas was 5s. 5d. In 1875-76 the yield of gas per ton of coals was 9746 feet, and the price of gas was 5s. and 4s. 7d. In 1876-77 the yield of gas per ton of coals was 9693 feet, and the price of gas was 4s. 2d. In 1877-78 the yield of gas per ton of coals was 10,028 feet, and the price of gas was 4s. These facts speak for themselves, and indicate, to some extent, how far the efforts of the Sub-Committee, in the purchase of coals, have been attended with advantage to the community. They form also a reply to the assertion, that inferior coals have, of late, been purchased. Last year was the first in which the coals yielded 10,000 feet and upwards per ton carbonized.

At the same meeting the question of the electric light came for the first time before the Gas Commissioners as a body, in consequence of the following item in the minutes of the Parliamentary Bills Committee:—"The Town Clerk submitted a copy of the Bill introduced into Parliament by the National Electric Light Corporation, Limited, and called attention to its provisions. The Committee were unanimously of opinion that the powers sought were most objectionable, and they accordingly resolved to recommend that it be remitted to the Town Clerk to co-operate with other Corporations in opposing the measure." In the course of the conversation which arose on the subject, and in answer to one of the members, who desired to know why such an obstructive policy had been resolved upon, it was said that the Committee had no objection to any improvement, either in gas lighting or any other kind of lighting, but that they could not consent to hand over their streets to any Company. The Town Clerk remarked that it was quite clear that if the time should ever arrive (and there seemed to be no immediate prospect of it) when electricity could be used for light-

ing the streets, he presumed that Corporations who supplied gas would provide the electric light.

While speaking of gas affairs in Glasgow, I may mention one or two facts of interest in connection with recent deliveries of gas from the various stations under the Corporation. During several days of last month upwards of 11 million cubic feet of gas were sent out, and on Friday, the 20th ult., the amount reached the enormous total of 11,985,000 cubic feet. It is also worthy of mention that, during the year ending Dec. 31, the total delivery of gas from the Corporation Gas-Works was 1,810,061 million cubic feet.

In its review of local affairs for the past year, one of the Dumfries journals refers to the gas question, as it has concerned the town at large, since the gas-works were taken over by the Town Council. Speaking of the inquiries made during the year by the Gas Committee regarding the deficient supply, the review says they resulted in the discovery that the main-pipes were in such a dilapidated condition that there was a loss of something like 25 per cent. of the gas manufactured. That was alarming, and no time was lost in renewing the defective pipes, at a considerable outlay, and there has consequently been a perceptible improvement in the supply of gas within the last month or two; but it is affirmed that there is great room for improvement, the illuminating power being still very feeble in some localities, the result, doubtless, of insufficient pressure. There is reason to hope, however, that as the Gas Committee become conversant with the technical details of management, and continue the vigilance they have recently shown in working the undertaking, it will prove not only a successful scheme, so far as the supply of gas is concerned, but also a profitable investment for the burgh.

On Wednesday week the annual meeting of the Macduff Gas Company was held—Mr. George in the chair. The balance-sheet and report were submitted by the Manager, and, after examination, were approved. A dividend at the rate of 3 per cent. was declared, and the Directors were re-elected for another year.

In the earlier part of last week the Glasgow pig iron warrant market was firm, and a large amount of business was done; but on Thursday and Friday, prices receded, and the market became very languid. Business was done on Friday at 43s. 1½d. to 43s. cash. The annual statistics of the Scotch iron trade, which have just been published, show very unfavourably in every particular.

The coal trade is in an exceedingly unsatisfactory condition. Prices remain practically unchanged, and the demand, except for household qualities, is very slow. Almost every coalowner is complaining of the unprofitable nature of his business.

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Hull Gas Supply.—Mr. J. Baynes, jun., F.I.C., F.C.S., F.R.M.S., the County and Borough Analyst, reports the following as the results of his tests of the gas supplied to the East district, by the Sutton, Southcoates, and Drypool Gas Company, during last year:—

| | Max. | Min. | Mean. |
|---|---|---|---|
| Illuminating power standard sperm candles | 16·94 | 14·65 | 16·06 |
| Grains of sulphur per 100 cubic feet . . . | 23·30 | 6·62 | 12·75 |
| Grains of ammonia per 100 cubic feet . . | 14·70 | 5·13 | 8·01 |

Mean barometer and temperature in experiment-room: Bar., 29·8; temp., 54·15°.

Birmingham Corporation (Differential Charges Repeal) Bill.—At the meeting of the King's Norton Union Rural Sanitary Authority, last Thursday, the Parliamentary Committee reported the deposit of the Bill as required by the Standing Orders of Parliament, and they recommended that the resolution of the 5th of December, on the subject of the application to Parliament, should be confirmed. The report stated that a letter had been received from the Secretary of the Gas Committee of the Birmingham Corporation, offering "to sell to the Authority, on fair and reasonable terms, the distributing apparatus, and the right to supply gas within the the district, or to treat on such terms for the abandonment of the extra 1s. per 1000 which they are now empowered to charge for gas supplied to the district." They recommended that a reply be sent to the Corporation to the effect that the Authority had not contemplated the making of gas on their own account, and that they considered the imposition of 1s. per 1000 extra for gas supplied to the district, whatever the cause might have been or might have been supposed to exist at the time the authority of Parliament was given for the charge, was now unnecessary, unequitable, unfair, and unjust, and for these reasons it ought to be discontinued without compensation. The report was adopted; and it was decided to send a deputation to the Birmingham Gas Committee, with the view of obtaining an amicable settlement of the difficulty.

The Sewage Question at Canterbury.—A special meeting of the Canterbury Town Council is summoned for to-morrow, to further consider the vexed question of the disposal of the town sewage. Mr. Fielding will submit a series of resolutions, which may be thus summarized: That the Council, having considered the letter received from the Commissioners of Sewers, is of opinion that the questions in dispute between them may be temporarily arrranged by an arbitrator being called in to ascertain whether any, and if so, what extra average annual cost has been reasonably incurred by the Commissioners, in consequence of the discharge into the River Stour of the effluent water from the sewage works. It is proposed that the Council agree (so far as they legally can) to pay to the Commissioners annually, for a period of five years, the sum found by the arbitrator as the amount of such extra average annual cost; that the Council agree to continue the process of filtration or other treatment, whatever it may be, at present carried on at the sewerage-house; and that an engineer, with the assistance of a gentleman acquainted with the agricultural and financial aspects of sewage utilization, be requested to report on the question af the ultimate disposal and utilization of the sewage. If these resolutions are adopted, the effect will, it is hoped, be to prevent a large expenditure of money in another sewage scheme, which, in the present undecided state of the question of the utilization of sewage, might, in all probability, turn out as unsatisfactory as the present system.

Opening of Gas-Works at Audley.—The gas-works which have recently been erected by the Audley (Staffs.) Local Board were formally opened on Tuesday the 24th ult. The buildings, which are situated near the road leading from Audley to Halmerend, consist of retort-house, purifier-house, lime shed, meter and governor-house, office, workshops, and manager's house. The retort-house is 30 feet by 35 feet, and contains at present eight retorts, hydraulic main, &c., from which the gas passed through an 8-inch pipe round the inside of the retort-house to the condensers, and thence to the scrubber, and from there, through a range of pipes, to the purifiers, two in number 6 feet square, with centre valve for four purifiers. The mains are laid throughout the district, and vary from 8-inch to 3-inch diameter, and are in length altogether about 6 miles. The works were designed, and plans and specifications prepared, by Mr. John Davies, Engineer and Manager to the Kidsgrove Gas Company, and the whole of the work, which was commenced in June last, has been carried out entirely under his direction. Great credit is due to that gentleman for the very prompt and efficient manner in which he has accomplished the undertaking. The capital raised for providing the means of supplying gas was £5000, the whole of which has not yet been expended, the fact being that, although the works are sufficiently advanced to be opened, they are not yet quite completed. The price to be charged for gas at the present time is fixed at 5s. per 1000 feet. In celebration of the opening, a dinner was given in the evening by the contractors for the works, Messrs. Drewitt and Pickering, and the executors of the late Mr. G. Barker.

A New Method of Determining High Temperatures.—In very many manufactures an enormous degree of heat is required for carrying out the various operations. The means hitherto at our disposal for testing those temperatures, which sometimes require to be accurately regulated, are limited by the point of fusion of the thermometric tube. M. Crova, Professor at the Faculty of Sciences at Montpellier, has had the ingenious idea of bringing the spectroscope to the aid of the manufacturer, and his efforts have been most successful. By the means he has adopted, heats hitherto incalculable can be determined very precisely. The process by which he proceeds is—roughly speaking—to adopt a fixed standard, and, having settled that point, to examine by the aid of a spectroscope, the flames of the incandescent objects, and reduce them, by interposing obstructives of known power, to the same level as the standard. That arrangement he calls a spectro photometer. Of course, in such an apparatus, the primary data must be purely arbitrary. M. Crova takes as the point of departure the heat emitted by an ordinary moderator lamp burning oil, and that he fixes at 1000. In comparing other incandescent substances with that standard, he finds that the heat of a piece of platinum, warmed to the red in a gaslight, is 524; the same material raised to a white heat by the blow-pipe, 810; a regulation stearine candle, 1162; an Argand burner of ordinary gas, 1373; the oxy-hydrogen light (common gas and oxygen on lime), 1806; the electric light (sixty Bunsen elements), 3060; and the light of the sun, 4049. Carbon, lime, and platinum, when incandescent, have the same power, and probably magnesium. This new system is calculated to be of vast importance to manufacture, by enabling the operator to regulator his fires so as to produce the precise effect desired. M. Dumas, in bringing the matter under the notice of the Academy of Sciences, stated that he considered it as the greatest discovery of modern times, and M. Berthelot warmly supported his statement.—*Galignani.*

Serious Gas Explosions.—On Friday night, the 27th ult., a serious gas explosion took place in the house of Miss Longland, a dressmaker, in Toll Street, Nottingham. Miss Harrison, a young lady staying with Miss Longland, noticed a strong smell of gas, and the tap of the meter having been turned off and a window opened, search was made with a lighted candle for the escape. On applying the light to the top of the chandelier, an explosion took place, knocking down Miss Longland and doing serious damage to the apartment. Miss Harrison was fortunately only slightly scorched; but the other lady was so seriously injured as to necessitate her removal to the General Hospital.—Another explosion of gas, fortunately unattended with serious personal consequences, took place late on Saturday evening, the 28th ult., at the residence of Mr. S. Walker, printer and paper-hanger, Portland Street, Lincoln. From some unexplained cause, an escape of gas occurred in the front drawing-room, and on Mr. Walker going into the apartment with a light in his hand an explosion took place, which blew out the windows, set fire to the Venetian blinds, and shattered the door, besides injuring the pictures and furniture. Fortunately, aid was at hand, and the flames were extinguished before serious damage was done.—On Tuesday afternoon, the 31st ult., an alarming explosion of gas occurred at the works of Messrs. W. and T. Avery, scale manufacturers, Moat Row, Birmingham. On the first floor of a three-storey building were three stoves, used for drying the japanned and painted ware, the necessary heat being supplied by gas. Between four and five o'clock, shortly after a workman had turned off the gas of one of the stoves, a loud explosion occurred. The first floor of the building was wrecked, the workshops above and below it were greatly damaged, and nearly the whole of the side-wall thrown down, whilst considerable mischief was done to goods in the course of manufacture, &c. A number of workpeople were employed in the building at the time of the explosion, but none of them sustained injuries of a serious character. They were all promptly rescued, and, with three exceptions, were able subsequently to return to their homes. The flames attending the explosion spread over a portion of the building, but were quickly extinguished. The explosion is believed to have originated through an accumulation of gas in one of the stoves.—On the same afternoon a serious explosion of gas took place in the residence of Mr. Parkinson, Bewsey Road, Warrington. Mr. Parkinson had noticed a smell of gas, but could not find the escape. However, on applying a light to the swing-joint of the chandelier in his parlour, an explosion resulted, blowing down Mr. Parkinson, and his wife and child, who were standing at the door of the apartment, which was very much damaged, as were also the ceiling and curtains. Mr. Parkinson was burnt about the head, neck, and hands, and the child was slightly burnt, but, owing to the promptitude with which the fire was extinguished, the furniture escaped with but little injury.

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## Register of New Patents.

3791.—Green, H., Preston, "*Improvements in apparatus for scrubbing coal gas, and for other purposes.*" Patent dated Oct. 12, 1877.

These improvements in coal-gas scrubbers are designed to provide, at moderate cost, a large amount of efficient scrubbing surface in a compact form, and to more efficiently distribute the water or liquor for scrubbing the gas.

In lieu of the coke, wood, or other substances heretofore usually employed to give the requisite scrubbing surface, there are provided, in the scrubbing vessel or chamber, frames in conjunction with suitably-arranged sheets or strips of fabric, such as coarse canvas or other similar cheap fabric, which are arranged in such manner as to leave the requisite space for the passage of gas between the scrubbing surfaces within the scrubbing vessel or chamber.

For distributing the water or liquor, a modification of the apparatus, described in the specification of a former patent, granted to the present inventor (dated Oct. 7, 1876, No. 3880), is employed. At the upper part of the scrubbing vessel is a central vertical pipe, capable of being rotated by suitable gearing. The lower end of the central pipe is provided with a branch pipe arranged to form, in conjunction with the central pipe, a liquid trap for preventing escape of gas, and to serve also as a bracket for carrying a bearing or socket, in which works, as a swivel, the axis of a wheel. The wheel axis carries a liquid-distributing pipe, in communication, through the axis, with the branch pipe and central pipe. As the central pipe is rotated, it carries round with it the branch pipe and distributing pipe, whose wheel, with its prolonged axis or swivel, is caused to simultaneously rotate by contact of the wheel with the teeth of a fixed annular wheel or ring. Thus the distributing pipe, whilst travelling around the central shaft, also rotates about the swivel which constitutes its axis.

In order to more evenly distribute the water or liquor, the wheel axis is made in the form of a small box or plug, closed at its bottom, and having lateral openings of a tapering form in the direction of the circumference

of the box or plug. Between the bottom of the box or plug and that of the socket in which it turns, is a space for water or liquor, and in the side of the socket is a vertical groove, passage, or channel, communicating with the space. As the box or plug revolves, its tapered openings travel successively past the vertical groove, passage, or channel, and whilst so passing, when the socket is charged, water or liquor will flow by the vertical groove, passage, or channel into the box or plug, and away by the distributing pipe, the quantity of water or liquor so passing depending upon the part of the tapering opening for the time being opposite to the vertical groove, passage, or channel.

The tapering holes are so arranged that whilst the outlet aperture of the distributing pipe is in its outer position—that is, whilst it is travelling in proximity to the side of the scrubbing vessel or chamber—the flow of water or liquor will be arrested. Shortly after the outlet aperture has commenced returning towards the centre of the vessel or chamber, one of the tapering openings will, at its wider end, come opposite to the vertical groove, passage, or channel, thus allowing water or liquor to flow into the box or plug, along the distributing pipe, and into the vessel or chamber, the quantity of water or liquor so flowing being gradually diminished as the distributing outlet approaches the centre of the vessel or chamber, before reaching which the flow will cease until the outlet has somewhat passed the innermost point of its course, when the narrow end of the next tapering opening will come opposite to the vertical groove, passage, or channel, and the flow of water or liquor will recommence, and gradually increase until the outlet has again nearly reached its outermost position, whereupon the flow will be again arrested, and so on.

As is well understood, the quantity of water or liquor supplied to coal-gas scrubbers varies considerably, according to the quantity of gas passing through; consequently, sometimes the supply of water or liquor might not suffice to fully charge the socket when the larger area of the opening is opposite to the vertical groove, passage, or channel. This contingency is provided for by arranging a tumbler or tilting vessel in or over a cistern, whence a pipe leads to the funnel of the central vertical pipe of the scrubber. The water or liquor from the main or reservoir is allowed to flow into the tumbler or tilting vessel, which, as it fills, will tilt, depositing the water or liquor in the cistern, whence it will flow to the central vertical pipe, branch pipe, and socket of the distributing apparatus, in readiness for use.

3815.—Gambier, H. C., Paris, "*Improvements in gas-stoves.*" Patent dated Oct. 15, 1877.

This invention relates to apparatus for producing heat and light, by means of a mixture of gas and air projected on a plane or undulated surface, upon which it is spread, and burns with an extended flame. This surface, which is made of metal, is suitably enclosed for utilizing the heat and light.

The construction of the apparatus is based on the following conditions:—The gas is discharged from a supply-pipe into a tube or compartment of larger diameter, which is placed in communication with the external air by means of a pipe. The gas there mixes with the air, which is carried by it into a third tube or compartment of still larger diameter, forming a reservoir of gasefied air, or fire-box. This reservoir is provided with a channel which brings the gaseous mixture into contact with atmospheric air, causing it to travel over an extended surface, where it burns with a large spreading flame.

Two or more of these apparatuses may be juxtaposed in order to increase the effect.

3817.—Hammond, J., Lewes, "*Improvements in purifying coal gas.*" Patent dated Oct. 15, 1877.

The object of this invention is the continuous purification of coal gas, in closed vessels, by strong liquid ammonia produced from the crude ammoniacal liquor of gas-works, and the ultimate recovery of the ammonia as sulphate of ammonia; also the prevention of naphthaline formations by the thorough absorption of the acid vapour contained in the gas.

In carrying out the invention, the crude ammoniacal liquor is conducted by proper arrangements to two suitable vessels (ordinary egg-end steam-boilers, each set over an ordinary furnace, will answer the purpose), properly provided with dampers, that each boiler may, as required, be fired independently of the other. These boilers have an arrangement of pipes and valves, so that the vapours escaping from the one may be conducted through the liquid contained in the other, and *vice versâ*.

The process is as follows:—The two boilers being filled to a proper height with the crude ammoniacal liquor, both fires are lighted under the boilers, and the escaping vapours from each boiler conducted by suitable pipes to a leaden vessel called, a saturator, filled to the proper height with a given quantity of sulphuric acid of a suitable strength for the manufacture of ammonia sulphate. The ammonia contained in the escaping vapours from the boilers is thus arrested, and coverted into sulphate of ammonia in the ordinary way. The saturator being constructed in such a manner that the gases or vapours, after passing through the sulphuric acid, are again collected, and, after proper cooling, may be passed through oxide of iron for the recovery of sulphur by well-known methods. The remaining gases can then be conducted over a red-hot furnace flue, and escape by the main chimney-shaft. The vapours or gases continue to pass freely from the boilers to the saturator and oxide vessel, till most of the carbonic acid and sulphuretted hydrogen are driven off from the crude liquor, also with sufficient ammonia to convert the given quantity of acid contained in the saturator into sulphate of ammonia. The boiler valves leading to the saturator are then closed, and the sulphate of ammonia taken out to a draining-table in the usual way, and a fresh supply of acid put into the saturator for the next operation. In the meantime, milk of lime has been mixed in an ordinary tub. High-pressure steam is used to expel the air contained in a strong and suitable iron vessel. The steam being shut off, a vacuum is produced in the iron vessel, whereby the whole of the milk of lime contained in the tub (*minus* the sediment) is drawn over the top of the tub, through pipes properly arranged, to the iron vessel. The cock or valve leading to the lime-tub is then closed, and the high-pressure steam turned on full to the iron vessel, and the whole of the milk of lime is driven into the boilers containing the crude ammoniacal liquor now under treatment. This milk of lime is in sufficient quantity to neutralize the acids now remaining in the ammoniacal liquor in the boilers, since the valves to the saturator were closed. The milk of lime and the liquor are then agitated together by high-pressure steam in the boilers, producing a strong chemical reaction, and setting free the ammonia in large quantities, and this agitation can be repeated as often as necessary, till the whole of the ammonia is driven off from the liquor in one boiler through the other boiler, or *vice versâ* (to keep up a continuous agitation of the contents of the boilers), the flue dampers and fires being regulated accordingly. As soon as this strong chemical reaction is produced by the milk of lime and high-pressure steam, the strong ammoniacal vapours are conducted, through suitable pipes and apparatus, to the hydraulic main of the gas-works, provision being made to regulate the temperature of vapours entering the hydraulic main. This strong ammoniacal vapour now condenses, in the ordinary condensing apparatus of the gas-works, in the form of strong liquid ammonia, and flows out comparatively cool with the tar and liquid from the outlet of the condenser to a closed vessel of suitable capacity, in which are arranged suitable coils of pipes, the cold water supply to the works being made to pass through these pipe-coils, to keep cool the contents of the closed vessel, and the tar settles away from the liquid ammonia, and can be drawn off as desired. The liquid ammonia being cold, can now be conducted to a suitable vessel, which may be termed a "scrubber-washer," so constructed as to bring the liquid ammonia and the crude gas into the closest possible contact, provision being made to free the crude gas from any remaining tarry impurity on its entrance, by direct contact with the liquor contained in the bottom of the vessel. The crude gas then passes up and between a series of thin circular rings or plates of metal or other suitable material, slightly concaved on the under and upper sides, and arranged in such numbers, and at such distances, as to give the best possible effect to the passing gas, which rushes, in the thinnest possible stream, close to the surface of the strong liquid ammonia now descending from plate to plate till it reaches the bottom, fully impregnated with the impurities from the crude gas (this liquid may now be used over again, as described, for the purpose of obtaining sulphate of ammonia and purifying the gas). The gas now passing this vessel is conducted to what is known as the tower, or clean-water scrubber, for the recovery of any ammonia escaping with the gas from the last vessel.

In purifying gas by this method, no trouble, it is claimed, is experienced from naphthaline deposits, and little or no work is left for ordinary lime purifiers, in proportion to the quantity and strength of liquid ammonia employed in the process.

3876.—Pitt, S., Sutton, Surrey, "*Improvements in producing, purifying, and regulating gas, and in apparatus employed therein.*" A communication. Patent dated Oct. 19, 1877.

The object of this invention is, first, to improve the process and apparatus for the manufacture and purification of non-luminant combustible gases, either for heating or as carriers of luminiferous vapours from bituminous coals or oils, as in illuminating gas, by the employment of free oxygen to support the combustion, and thereby the temperature in the generator, and purifying the product by passing it through incandescent charcoal.

A further object of this invention is to improve the processes and apparatus employed in the manufacture of illuminating gas, so that the generally-recognized waste heretofore incident to this manufacture may be avoided by using non-luminant gases procured from steam and coke, or coal, at a high temperature, to carry the luminiferous vapours, instead of decomposing four-fifths of the rich luminiferous hydrocarbons from the coal to obtain the non-luminant gas for carrying the other fifth, as in the old process, thus utilizing the entire luminiferous value of the coal as such, and obtaining the non-luminant or carrying gas from a much cheaper source, and to obviate the difficulties heretofore presented in the interrupted process of coal distillation in combination with water gas by a continuous or uninterrupted process, whereby the yield of hydrocarbon becomes uniform, and can most readily be proportioned to the water gas introduced.

A further object of this invention is to present in the same apparatus such facilities as adapt it to the most economical distillation of coal, and also for the volatilization of liquid hydrocarbons when introduced upon such coal. In but few localities can petroleum be used for this purpose without increasing the cost of manufacture far above that from coal, as the coal oils are of about two and a half times the illuminating value of petroleum, to which must be added the hazard and the inconvenience of handling.

A further object of this invention is to provide certain improvements in gas-pressure regulators.

This invention consists, first, in the process herein described for producing and purifying non-luminant gas, either for the purposes of fuel for heating, or as a vehicle for carrying luminant matters from coal or oil, as the non-luminant gases now do in ordinary illuminating coal gas.

The means employed consist—

1. Of coal or coke in an active state of combustion in a closed chamber, which may be partially heated upon the outside.
2. In an adjoining compartment, incandescent charcoal.
3. In the introduction of steam and oxygen gas, the latter as existing in any other combination than as in water or atmospheric air, either separately or combined, near the grate which supports the coal or coke first referred to.

The oxygen, both free and that combined with the hydrogen in the steam, unites with the carbon to produce carbonic oxide, the former developing heat to replace that carried away by the resulting gases, and by radiation from the apparatus, while the incandescent charcoal serves to arrest and decompose any carbonic acid which may have been produced, converting it into carbonic oxide.

This invention also consists in the process herein described for obtaining the maximum value of illuminating matter from bituminous coal for the production of illuminating gas, by distilling or roasting bituminous coal at a low temperature for the expulsion of all volatile matters therefrom, and, while being so treated, introducing combustible non-luminant gases, such as water gas, hydrogen, carbonic oxide, marsh gas, or either of them, beneath, and passing it upwardly through such coal while being so distilled, for the purpose of carburetting the non-luminant gases, and conveying all luminiferous matters from the distilling coal to a superheating retort, where the hydrocarbon vapours from the coal are permanently combined with the non-luminant gases without decomposition, resulting in illuminating gas of standard quality, substantially as herein specified.

This invention also consists in the process herein described for producing illuminating gas from bituminous coal, hydrocarbon oils, and water gas.

1. By means of the hydrocarbon vapours, as they are distilled from such coal at a low temperature in a closed chamber.
2. By means of petroleum, or other hydrocarbon in a liquid form, introduced to, and volatilized from such coal.
3. By means of the introduction of hydrogen, carbonic oxide, marsh gas, or water gas, so called, or either of them, and passing the same upwardly through such coal, thereby conveying all volatile matters from the coal or oil to a connected retort, which being maintained at a proper temperature, all the hydrocarbons are permanently combined therein with such non-luminant gases, resulting in illuminating gas of standard commercial value.

3900.—Thompson, W., and Maw, G., Sheffield, "*Improvements in means and apparatus for generating heat by gas and air, applicable to stoves and other purposes.*" Patent dated Oct. 22, 1877.

This invention consists in improvements in the means and apparatus for generating heat by gas and air, applicable to stoves, trivets, and similar and other purposes.

The improved apparatus consists of a chamber in which the gas and air are mixed, the said chamber being conical in form, or of less area at the bottom than it is at the top, or it can be of greater area at the bottom than it is at the top. Into this mixing chamber the gas enters by a pipe or pipes through a hole (by preference) in the centre of the bottom thereof, the hole through which the gas-pipe passes being a little larger than the

external diameter of the said pipe, so that air can enter through the said hole into the mixing chamber. Air enters either directly through holes in the bottom thereof, or through tubes in the bottom thereof, or through holes in the sides thereof, and in such directions as to mix with the gas under the same conditions as though it entered through holes in the bottom of the said chamber, and by preference, the orifice or orifices through which the gas enters the chamber are on a level with the orifices, or majority of the orifices, through which the air enters the mixing chamber. The gas can enter the chamber in one or more jets, according to the quantity required. At the top of the mixing chamber is a plate pierced by a number of holes, the number and size of the holes being in proportion to the size of the "stove" or "trivet" and the size of the mixing chamber.

The apparatus can be formed of iron, copper, or other suitable materials or combination of materials, but it is preferred to line the mixing chamber with a fire-resisting material, or other composition which can be replaced as required.

The apparatus can be used by itself, in the way ordinary gas trivets are used, or it can be combined with a boiler, or with a cooking apparatus, or be otherwise employed.

## APPLICATIONS FOR LETTERS PATENT.

5281.—THOMPSON, A. M., and EARL, H. D., Crewe, Chester, "Improvements in the construction of electric lamps." Dec. 27, 1878.

5291.—VERSMANN, F., Finsbury, and QUAGLIO, J. VON, Brompton, London, "Improvements in purifying coal gas." Dec. 27, 1878.

5295.—NOTTBECK, C. DE, Petersburg, Russia, "Improvements in apparatus for the discharge of water, resulting from condensation in steam-pipes and other receivers." Dec. 27, 1878.

5306.—EDISON, T. A., New Jersey, U.S.A., "Improvements in means for developing magnetism and electric currents, and in apparatus for illuminating by electricity." Dec. 28, 1878.

5307.—FREEMAN, J. B., Tottenham, London, "Improvements in the carbons employed in the production of the electric light." Dec. 28, 1878.

## Share List of Gas and Water Companies.

*(Corrected by Mr. F. N. GOLDING, Sun Court, Cornhill, from the latest Stock Exchange Quotations.)*

| Number of Shares issued. | Amount per Share. | Name. | Amount paid up per Share. | Last Divd. p.Cent. p. Ann. | Latest Quotations. |
|---|---|---|---|---|---|
| | £ | GAS COMPANIES. | £ s. d | £ s. d | £ |
| 589892 | 10 | Alliance and Dublin | 10 0 0 | 10 0 0 | 14—15 |
| 10000 | 20 | Anglo-Romano . . | 20 0 0 | 10 0 0 | 20—23 |
| 5000 | 20 | Bahia (Limited). . | 20 0 0 | 3 0 0 | 9—11 |
| 1000 | 20 | Do., do., redeem. | 20 0 0 | 10 0 0 | 25—27 |
| 1500 | 20 | Do., 2nd pref. . . | 20 0 0 | 7 10 0 | 18—20 |
| 40000 | 5 | Bombay (Limited). | 5 0 0 | 7 10 0 | 5½—6 |
| 10000 | 5 | Do., fourth issue. | 4 0 0 | 7 0 0 | par-¼pm |
| 5000 | 20 | Bournemouth . . . | 10 0 0 | 7 0 0 | .. |
| 229700 | .. | Brentford . . . . . | 100 0 0 | 9 0 0 | 135—140 |
| .. | .. | Do., 5 per ct. pref. | 100 0 0 | 5 0 0 | 90—93 |
| .. | 20 | Do., C shares . . | 16 0 0 | 9 0 0 | 5—6 pm. |
| 5100 | 20 | Brighton . . . . . | 20 0 0 | 10 0 0 | 25—27 |
| 5000 | 20 | Brighton and Hove | 20 0 0 | 10 0 0 | 25—27 |
| 14000 | 20 | British (Limited) . | 20 0 0 | 10 0 0 | 30—31 |
| 7223 | 20 | Cagliari (Limited). | 20 0 0 | 7 0 0 | 16—18 |
| 1500 | 10 | Colney Hatch . . . | 10 0 0 | 5 0 0 | 7—8 |
| 55000*l.* | Sk. | Commercial . . . . | 100 0 0 | 10 10 0 | 160—165 |
| 70000*l.* | Sk. | Do., 7 per cent. . | 100 0 0 | 7 10 0 | 115—125 |
| 20000 | 20 | Continental Union. | 20 0 0 | 6 10 0 | 16—17 |
| 20000 | 20 | Do., new . . . . | 14 0 0 | 6 10 0 | 4-3 dis. |
| 10000 | 20 | Do., preference . | 20 0 0 | 7 0 0 | 21—28 |
| 75000*l.* | Sk. | Crystal Palace Dist. | 100 0 0 | 10 0 0 | 155—160 |
| 125000*l.* | Sk. | Do., 7 per cent. . | 100 0 0 | 7 0 0 | 120—125 |
| 50000*l.* | Sk. | Do., preference . | 100 0 0 | 6 0 0 | 110—115 |
| 7100 | 25 | Edinburgh . . . . | 25 0 0 | 10 0 0 | 43—46 |
| 23406 | 10 | European (Limited) | 10 0 0 | 10 0 0 | 13½—14½ |
| 12000 | 10 | Do., new shares. | 7 10 0 | 10 0 0 | 2½-3½pm |
| 35406 | 10 | Do., new shares . | 5 0 0 | 10 0 0 | 1½-2½pm |
| 4096300*l.* | Sk. | Gaslight & Coke A. | 100 0 0 | 10 0 0 | 160—165 |
| 100000*l.* | Sk. | Do. B. . . . . | 100 0 0 | 4 0 0 | 70—75 |
| 50000 | 10 | Do. 5 per ct. pref. conv., 4th issue. | 10 0 0 | 5 0 0 | 14½—15½ |
| 50000 | 10 | Do. do., 5th do. . | 10 0 0 | 5 0 0 | 3½-4½pm |
| 200000*l.* | Sk. | Do. C 10 p.c. pref. | 100 0 0 | 10 0 0 | 188—192 |
| 300000*l.* | „ | Do. D do. do. . | 100 0 0 | 10 0 0 | 188—192 |
| 165000*l.* | „ | Do. E do. do. . | 100 0 0 | 10 0 0 | 188—192 |
| 30000*l.* | „ | Do. F 5 do. do. . | 100 0 0 | 5 0 0 | 92—97 |
| 60000*l.* | „ | Do. G 7½ do. do. . | 100 0 0 | 7 10 0 | 135—145 |
| 1300000*l.* | „ | Do. H . . . . . | 100 0 0 | 7 0 0 | 117—122 |
| 6200 | 5 | Georgetown, Guiana | 5 0 0 | 7 0 0 | .. |
| 300000 | 100 | Glasgow Corporation Gas . . . . | 100 0 0 | 9 0 0 | 200—205 |
| | | Do., do. . . . . | 100 0 0 | 6 15 0 | 150—155 |
| 115000 | 100 | Do., new . . . . | 100 0 0 | .. | 182—187 |
| .. | 100 | Grimsby Gas, A . . | 10 0 0 | 10 0 0 | 13—14 |
| .. | 10 | Hampton Court . . | 10 0 0 | 10 0 0 | .. |
| 7000 | 10 | Hong Kong (Lim.) | 10 0 0 | 10 0 0 | 14—16 |
| 5000 | 10 | Hornsey . . . . . | 10 0 0 | 10 0 0 | .. |
| 2000000 | 50 | Imperl. Continental | 100 0 0 | 5*l.* p.sh. | 150—155 xd. |
| .. | .. | Kingston . . . . . | .. | .. | .. |
| .. | .. | Lea Bridge . . . . | .. | .. | .. |
| 9000 | 4 | Limerick Gas . . . | 4 0 0 | 3 15 0 | 2—2½ |
| 56100*l.* | 100 | Liverpool United . | 100 0 0 | 10 0 0 | 150—152 |
| 169100*l.* | 100 | Do., B . . . . . | 100 0 0 | 7 0 0 | 120—123 |
| 3865000*l.* | Sk. | London . . . . . | 100 0 0 | 10 0 0 | 160—165 |
| 1500000*l.* | Sk. | Do., 1st pref. . . | 100 0 0 | 6 0 0 | 115—120 |
| 8550 | Sk. | Do., 2nd pref. . | 100 0 0 | 6 0 0 | 100—106 |
| 7622 | 25 | Do., A shares . . | 25 0 0 | 6 0 0 | 21—23 |
| 266920*l.* | Sk. | Do., Debent. stk. | 100 0 0 | 5*l.* & 6*l.* | .. |
| 15000 | 5 | Malta and Mediterranean (Limited). | 5 0 0 | 2 10 0 | 1¾—2¼ |
| 6000 | 5 | Do., preference . | 5 0 0 | 7 10 0 | 5—6 |
| 20000 | 5 | Mauritius (Limited) | 2 5 0 | 3 6 8 | 1¾-1¼ dis |
| 25000 | 20 | Monte Video (Lim.) | 20 0 0 | 8 0 0 | 11¼—12½ |
| 8000 | 10 | Nictheroy, Braz. (L.) | 10 0 0 | 5 0 0 | .. |
| 30000 | 5 | Oriental (Calcutta). | 5 0 0 | 9 0 0 | 5¾—6¼ |
| 30000 | 5 | Do., new shares . | 3 10 0 | 9 0 0 | par-¼pm |
| 10000 | 5 | Ottoman (Limited). | 5 0 0 | 3 0 0 | 2—2½ |
| 10000 | 10 | Pará (Limited) . . | 10 0 0 | 3 0 0 | 4—5 |
| 27000 | 20 | Phœnix . . . . . | 20 0 0 | 10 0 0 | 31—33 |
| 360000*l.* | 100 | Do., new max. 7½ | 80 0 0 | 7 10 0 | 90—100 |
| 144000*l.* | Sk. | Do., capitalized . | 100 0 0 | 5 0 0 | 90—100 |
| .. | 20 | Do., new, 1876. . | 16 0 0 | 10 0 0 | 8-10 pm. |
| .. | .. | Richmond (Surrey) | .. | .. | .. |
| 37500 | 20 | Rio de Janeiro (L.) | 20 0 0 | 10 0 0 | 18—20 |
| 1500 | 32½ | Shanghai . . . . . | 32 10 0 | 12 0 0 | .. |
| .. | 100 | Sheffield, A . . . . | 100 0 0 | 10 0 0 | 172—173 |
| .. | 100 | Do., C . . . . . | 100 0 0 | 10 0 0 | 171—173 |
| 12500 | 5 | Singapore (Limited. | 5 0 0 | 7 10 0 | 5½—5¾ |
| 2000 | 5 | Do., preference . | 5 0 0 | 7 10 0 | 5¾—6½ |
| 4000 | 50 | South Metropolitan | 50 0 0 | 11 10 0 | 87—90 |
| 4000 | 12½ | Do. . . . . | 12 10 0 | 11 10 0 | 22—24 |
| 20000 | 12½ | Do., new shares . | 12 10 0 | 11 10 0 | 22—24 |
| 15000 | 10 | Surrey Consumers. | 10 0 0 | 10 0 0 | 14½—15½ |
| 10000 | 10 | Do., new . . . . | 8 0 0 | 10 0 0 | 3¼-4¼pm |
| | 5 | Tottenham and Edmonton . . . . | 5 0 0 | 10 0 0 | 7—8 |
| 1500 | 10 | Wandsw. & Putney | 10 0 0 | 10 0 0 | 14½—15 |
| 1800 | 10 | Do. . . . . | 10 0 0 | 7 10 0 | 10½—11½ |
| 4000 | 10 | Do. . . . . | 10 0 0 | 7 0 0 | .. |
| 26000 | 5 | West Ham . . . . | 5 0 0 | 10 0 0 | 7—8 |
| .. | .. | West Kent . . . . | .. | .. | .. |
| .. | .. | Woolwich, Plmstd., and Charlton . . | .. | 10 15 0 | .. |
| | | WATER COMPANIES. | | | |
| 615600 | 100 | Chelsea . . . . . | 100 0 0 | 6 0 0 | 148—152 |
| 1624700 | 100 | East London . . . | 100 0 0 | 6 0 0 | 148—152 |
| 10798 | 50 | Grand Junction . . | 50 0 0 | 5 0 0 | 81—85 |
| 5840 | 25 | Do., ½ shares . . | 25 0 0 | 5 0 0 | 41—43 |
| 6160 | 25 | Do., new ditto; max. div., 7½ p.c. | 25 0 0 | 5 0 0 | 35—37 |
| 5551807. | 100 | Kent . . . . . | 100 0 0 | 8 0 0 | 207—215 |
| 7818001. | 100 | Lambeth . . . . . | 100 0 0 | 6 5 0 | 150—153 |
| 3261501. | 100 | Do., max., 7½ p.c. | 100 0 0 | 6 5 0 | 147—150 |
| 442 | 100 | New River . . . . | 100 0 0 | 7 0 0 | 320—350 |
| 4475 | 100 | Do. . . . . | 85 0 0 | 7 0 0 | 280—360 |
| 400000 | 100 | Do., deb. sk., 4 p.c. | 100 0 0 | 4 0 0 | 101—103 |
| 6668001. | 100 | Southwrk. & Vauxh. | 100 0 0 | 4 0 0 | 108—111 |
| 3247001. | 100 | Do., pref. stock . | 100 0 0 | 5 0 0 | 113—116 |
| 1265001. | 100 | Do., D shares . . | 100 0 0 | 4 0 0 | 106—109 |
| 700001. | 100 | Do., new ordinary | .. | 4 10 0 | .. |
| 1600 | 100 | Do., new ord. No. 1 | 40 0 0 | 4 10 0 | .. |
| 15073 | 61 | West Middlesex . . | 61 0 0 | 6*l.* p.sh. | 135—138 |


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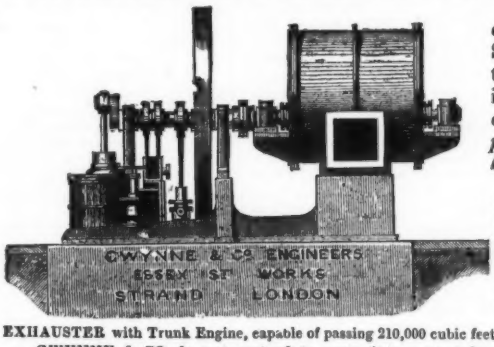


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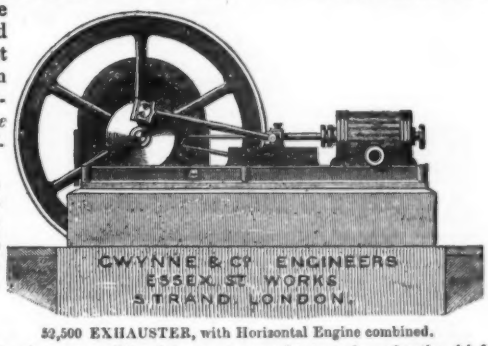


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**WANTED, by Samuel Thompson & Co.,** Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.
John Leigh, Esq., M.B.C.S., F.C.S., &c ,&c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

**WANTED, Readers of NEW EDITION,** 1879, "Cooking and Heating by Gas;" on Burners, &c.
Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, A.I.C.E., Gas-Works, SYDENHAM, S.E.

TAR AND AMMONIACAL LIQUOR.

**THE Directors of the Petworth Gas** Company are prepared to receive TENDERS for the Purchase of Surplus TAR and LIQUOR produced at their Works for One or more years.
Tenders to be addressed to the MANAGER, Petworth, not later than Jan. 12, 1879.

**THE Directors of the Lowestoft Gas** Company are prepared to receive TENDERS for the Purchase of the Surplus TAR and the whole of the AMMONIACAL LIQUOR produced at their Works for Three years from the 7th of February next.
Sealed tenders, addressed to the Manager and endorsed "Tender for Tar," to be delivered not later than Jan. 25, 1879.
The Directors do not bind themselves to accept the highest or any tender.
JOHN AYRIS, Manager.
Lowestoft, Jan. 2, 1879.

**LEEDS Corporation Gas-Works. Tenders** solicited for the Supply and Erection, at Meadow Lane Works, of Ten Cast-Iron PURIFIERS, each 33 ft. by 19 ft.; also for Four PURIFIER LIDS, each 14 ft. by 18 ft., to be erected at New Wortley Works.
Drawings and specifications can be had on application to Mr. Woodall, Engineer.
Separate tenders for each apparatus to be addressed "Chairman, Gas-Office, Boar Lane," not later than Tuesday, the 14th of January inst.
The lowest or any tender will not necessarily be accepted.

TENDERS FOR SULPHATE OF AMMONIA AND TAR.

**THE Directors of the Devonport Gas and** Coke Company are prepared to receive TENDERS for their make of SULPHATE of AMMONIA and their surplus TAR, for a period of Twelve months, from Feb. 1, 1879.
Estimated make of Sulphate about 100 tons per annum; surplus Tar, 50,000 gallons.
Specifications may be had on application to the Secretary.
Tenders to be delivered on or before Monday, the 20th inst., addressed to the Chairman, Devonport Gas and Coke Company.
By order,
JOHN WILLING, Secretary.

AMMONIACAL LIQUOR.

**SPENCE and STEWART, Frizinghall,** near Shipley, YORKSHIRE, are Purchasers of above.

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**TWO Freehold Gas-Works to be Sold,** or Let on Lease for long terms, or on short terms for Experimental Purposes, for which they are well adapted; including Mains, Services, Meters, and Lamps. Distance from London, one 18 miles and the other 30. The sale of gas is over 1½ millions per annum each.
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**THE Woolton Gas Company have for** disposal a quantity of GAS PLANT suitable for a small Gas-Works. Consisting of Hydraulic Main, Mouthpieces, Ascension-Pipes, 6-in. Condensers, Scrubber, set of four Purifiers, 5 ft. square and 3 ft. deep, with Grids and Centre-Valve, complete. All the above is in good order, having recently been replaced by larger plant.
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HENRY HATCH, Manager.

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**THE Gas Committee of the Corporation** of Manchester have under consideration the desirableness of holding an Exhibition of Gas Apparatus, and they are prepared to receive Price Lists with Illustrations and detailed particulars of Gas Engines and every description of Gas Apparatus for Cooking, Heating, and Ventilation, or any other purpose.
All communications to be addressed to the Chairman of the Gas Committee on or before Jan. 31, 1879.
By order,
JOSEPH HEBON, Town Clerk.
Town Hall, Manchester, Dec. 24, 1878.

BOROUGH OF BRADFORD.

EXHIBITION OF GAS-STOVES, GAS-ENGINES, GAS-BURNERS, AND OTHER APPLIANCES AND INVENTIONS FOR THE ECONOMIC USE OF GAS FOR DOMESTIC AND MANUFACTURING PURPOSES.

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Any information may be obtained on application to me at the undernamed office.
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Town Clerk's Office, Town Hall, Bradford,
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A Pamphlet descriptive of the above method, post free, 6½d.

## GEORGE BRAY & CO.'S
NEW
## Illustrated Catalogue
OF
## GAS-BURNERS.

See Page 29.

## W. LIDDALL,
**Public Accountant,**
MOORGATE STREET CHAMBERS,
**GREAT SWAN ALLEY,**
**MOORGATE STREET, E.C.**

TO INVENTORS AND PATENTEES.

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| Imperial Stone. | Light Stone. |
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The Forms of Account, which have been specially designed to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, and have been universally approved.

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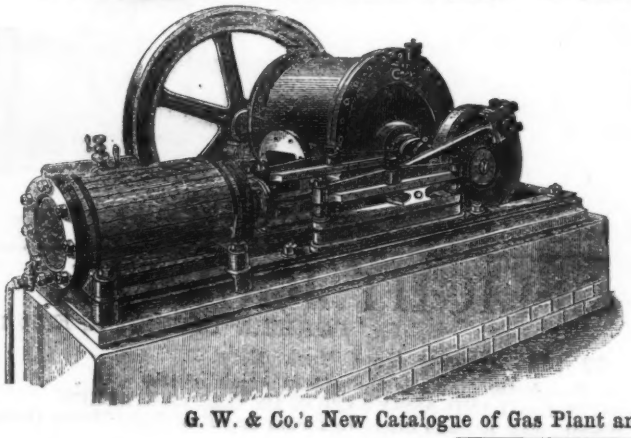

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MAKERS OF ENGINES, EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, BYE-PASS VALVES, TAR, LIQUOR, AND OTHER PUMPS, SCRUBBERS AND PURIFIERS, CONDENSERS, BOILERS, &c.

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These Wet Meters, being on the Imperial Meter Company's Patent Compensating Principle, will register with absolute accuracy, and keep an unvarying Water-Line for ten or twelve months without attention.

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As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather, India-Rubber, and Gutta-Percha Machine-Bands, Sheet and Washers, and Steam Joints.

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COUNTY OF DURHAM.
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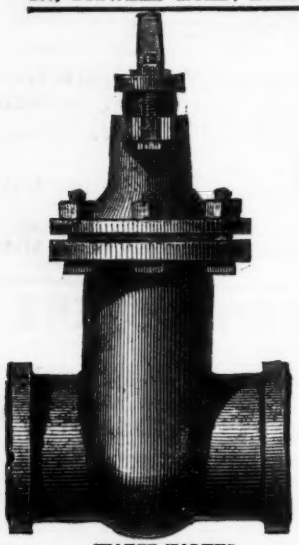

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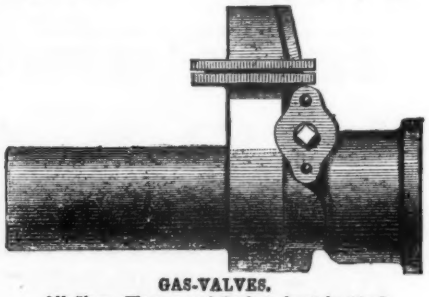

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This Volume contains 460 pages of Letterpress, and is illustrated by 521 Woodcuts and 36 page and double-page Engravings, printed on Plate paper, and a full-page
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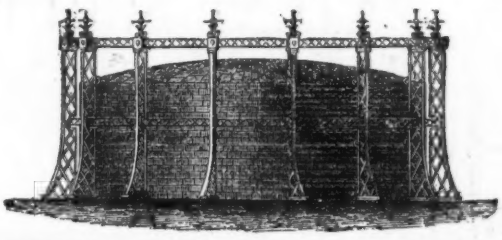

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More than 10,000 in use,

ESPECIALLY ADAPTED FOR USE IN GAS AND CHEMICAL WORKS, FOR PUMPING TAR, WATER, AMMONIACAL LIQUOR, ACIDS, &c.

The following are some of the prominent advantages of the BLAKE PUMP:—

It will start at any point of stroke.

It has no dead point.

It works fast or slow, with the same certainty of action.

It is economical. Has a lead on the slide-valve.

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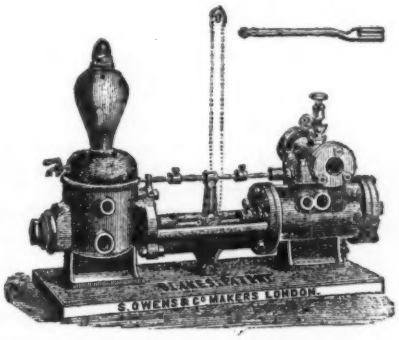


It is interchangeable in all its working parts.

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Can be worked at 20 strokes per hour, or 200 strokes per minute.

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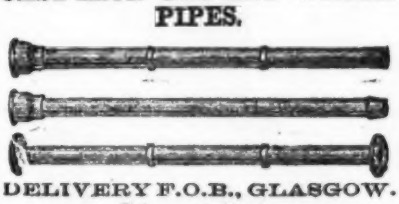

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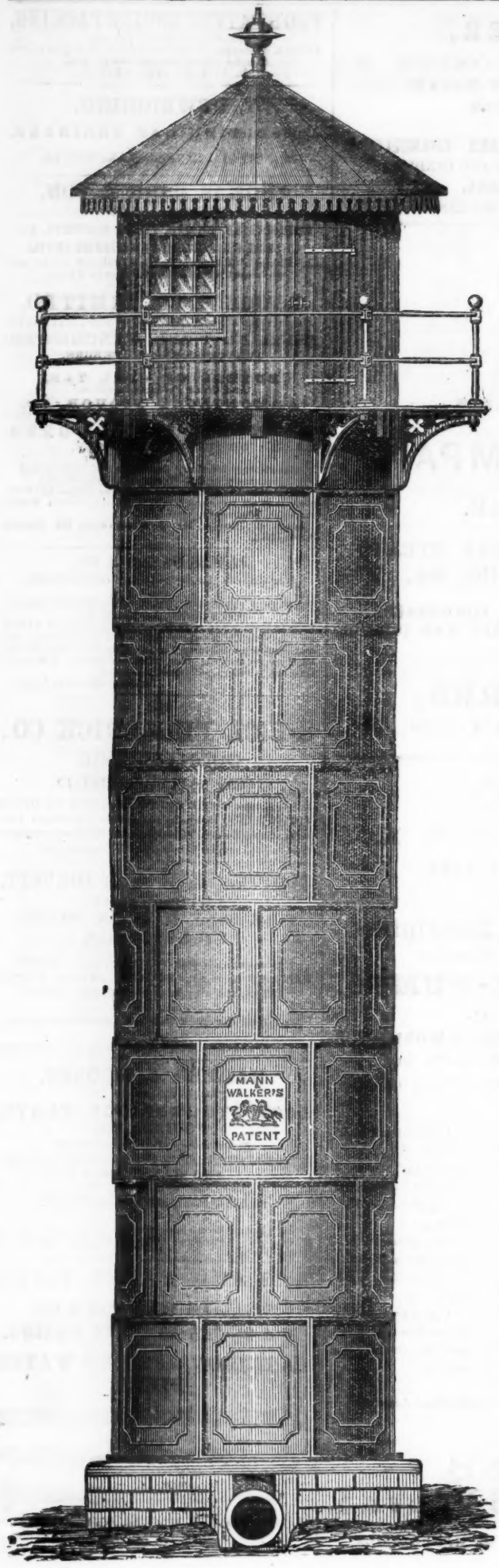
*Prices on application.*




C. & W. WALKER,
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# MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

**By some important improvements recently** patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

**It is to be particularly noted that the im-** portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

**Fifty million cubic feet of gas per 24 hours** are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

**Generally, wherever a high standard of** purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

**By their use the department of purification** from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

**Foul Gas, properly condensed, entering the** inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

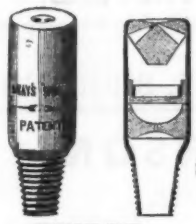
**They contain their own engine power, re-** quiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

**Applications relating to dimensions and** prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

# DESCRIPTIVE CATALOGUE
OF
# BRAY'S "ENAMEL" GAS-BURNERS.

In presenting this Catalogue, we wish it to be known that we are the only Manufacturers in Great Britain of Non-Corrosive Slit-Union Burners. We make them under Patents taken out here, and in several Foreign countries, of our own material, "Enamel," which is much harder and less brittle than "Steotite" (of which the imported Slit-Unions are made), and, therefore, less liable to fracture. We may also state that our burner factory is the most extensive in the World, and the only one in which composite Non-Corrosive Gas-burners are made *in all their parts*,—facts which give us the power of meeting the various requirements of gas illumination in a way that cannot be accomplished by those who make up burners from parts which are purchased from widely scattered sources.

## BRAY'S "SPECIAL"



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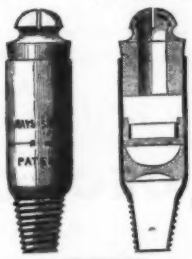

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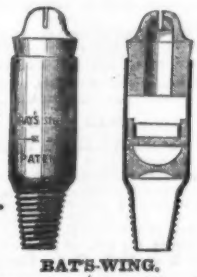

UNION-JET. SLIT-UNION. BAT'S-WING.

We believe our "Special" Burners, as improved, are more adaptable to the requirements of gas illumination than any now before the public. They can be made to suit any pressure or quality of gas (including air gas), give a well-shaped and steady flame, the gas inlet is so placed that it cannot be tampered with, and they are not liable to get out of order.

**TWO DISTINCT CLASSES** of burners are made, as regards lighting power—viz., for "*Highest Lighting Power*," *and* "*Medium Lighting Power.*"

**THE HIGHEST LIGHTING POWER CLASS** are made to develop the greatest possible amount of light as tested in the Laboratory, and they surpass those supplied by any other maker or dealer, whatever the price charged. When this class is required, it must be distinctly stated so when ordering, at the same time giving quality of gas, and consumption required.

**THE MEDIUM LIGHTING POWER CLASS** are those which our experience leads us to recommend for general use, in preference to any which yield in the Laboratory the highest lighting power. The latter, whoever they are made by, will always be within, or near, the smoking point, and smoke freely with the slightest atmospheric commotion. To avoid the evils arising from these features, we recommend our medium lighting-power burners, the flames of which are kept well away from the smoking point, and are made to withstand atmospheric commotion better than the other class; and will do good service at a lower pressure, and give, we doubt not, *in general use*, as much light. All our "Special" burners are sent out of "Medium Lighting Power Class," unless otherwise ordered.

**THE SIZES OF BURNERS** are from No. 0 to 9 inclusive.

**FOR SIXTEEN-CANDLE GAS** (or 14 to 18 candles), the sizes from No. 4 to 9, inclusive, are those which yield the best results from 4 feet of gas and upwards; the lower numbers are for less consumptions.

**FOR TWENTY-CANDLE GAS** (or 19 to 22 candles), the sizes from No. 3 to 8, inclusive, yield the best results from 3 feet of gas and upwards; the lower numbers being for less consumptions.

**FOR TWENTY-FIVE CANDLE GAS** (or 23 to 27 candles), the sizes from No. 4 to 9, inclusive, yield the best results from 2½ feet and upwards. When burners are required for this quality, "for Cannel gas" must be distinctly stated when ordering.

**FOR OTHER QUALITIES OF GAS** (including air gas), burners are made to order.

**PRESSURE.** All our "Special" burners are made (unless otherwise ordered) to give a suitable spread of flame at five-tenths pressure, and keep in good shape up to twenty-tenths; but we make to order suitable for any specified pressure up to forty-tenths.

**STREET-LAMPS.** For this purpose these burners are of exceptional value. Those suitable for consumptions of, say, 3, 4, or 5 feet per hour may be made to consume that quantity at any specified pressure from five-tenths to forty-tenths; therefore, a selection of burners may be had, adapted to the several pressures of a town, by the use of which the consumption in the lamps may be balanced with a nicety not equalled by the ordinary working of governors, with the further great advantage of a reduced consumption, when the light is not required, by the usual reduction of pressure in the street-mains at midnight. In ordering for this purpose, it is necessary to state the quality of gas, the consumption, and the number of burners required for each pressure. Extended particulars on this subject will be supplied on application.

**FITTINGS.** We make our burners to suit the fittings of any country, but, unless otherwise ordered, they are sent out English taper-screw.

**FOR GLOBES,** the "Bat's-wings" are not suitable, the "Union-Jets" and the "Slit-Unions" are.

## BRAY'S "ENAMEL" REGULATORS.

All these Burners are Stamped "Bray's Patent Enamel Regulator," as shown in wood cut.

All these Burners are Stamped "Bray's Patent Enamel Regulator," as shown in wood cut.

UNION-JET. SLIT-UNION. BAT'S-WING.

**THE NAME** "Regulator" was given to these burners when introduced eleven years ago, because burners having a medium in their interior for gas to pass through, had then become known as "Regulators." Our Union-Jets and Bat's-wings were originally introduced (and now the Slit-Unions are added) to remove two defects in the common metal burners—corrosion and roaring flames,—and our enterprise has been so far successful that the metal burners have been almost supplanted. A steady well-shaped flame is produced by the combined excellence of the tip and the medium through which the gas has to pass in the interior of the burner.

**LIGHTING POWER.** Though their lighting power is not equal to the "Specials," nor so much under control, yet they are far superior, in this respect, to the common metal burners, with which they closely correspond in price.

**THE SIZES** are, in Union-Jets and Slit-Unions, Nos. 0 to 8, in Bat's-wings, Nos. 0 to 10 inclusive.

## BRAY'S "ENAMEL" NON-REGULATOR.

These are similar burners in outward appearance to the Regulators, but somewhat less, and are without the interior regulating medium. Though they do not prevent the roaring and flickering, as the regulators do, they are excellent burners at the price charged. Our name is not stamped on these burners.

**THE SIZES** are, in Union-Jets and Slit-Unions, Nos. 0 to 8, and in Bat's-wings, Nos. 0 to 10 inclusive.

### BRAY'S MARKET BURNERS.

These are Bat's-wings of unusually large size, and are admirably adapted for markets, butchers, and any purpose for which an immense flame is essential.

**THE SIZES ARE** Nos. 19 and 20.

All these burners are stamped "Bray's Market Burner," as shown in wood cut.

### The RAT'S-TAIL or ONE-HOLE BURNER.

This burner shoots out a straight jet, like a rat's tail, and is used to some extent in Scotland for illuminating purposes; and there, as elsewhere, for heating, cooking, pipe lighting, and other purposes.

**THE SIZES** kept in stock are Nos. 0 to 6 inclusive, but any other size is made to order.

**Every Description of Gas-Burner not herein mentioned made to order in "Enamel."**

# GEO. BRAY & CO., BLACKMAN LANE, LEEDS.

## ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

### SHOTT'S BOGHEAD.

### LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

### MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

### OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

*Prices and full Analyses on application.*

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

## SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

## JAMES M'KELVIE,

CANNEL COAL MERCHANT,

HAYMARKET, EDINBURGH.

*Established* 1840.

## DEAN'S PRIMROSE GAS COALS.

*South Metropolitan Gaslight and Coke Company, London, July* 12, 1878.

The Owners of the Dean's Primrose Colliery.

Dear Sirs,—I have much pleasure in stating that this Company have regularly used your Coals for more than thirty years, and that in all essential particulars they give the most satisfactory results.

The yield of Gas is from 9700 to 9800 feet per ton, of full 16 candles illuminating power, tested by the London Referees Standard Burner; and the Coke is of very good quality, while the quantity is about 40 bushels to the ton of Coal.

I consider Dean's Primrose Coals to rank amongst the first-class Gas Coals from the Durham Coal-Field.

Yours truly, GEORGE LIVESEY.

These Coals are also used by The Gaslight and Coke Company (London), and other English and Foreign Gas Companies.

Steamers loaded with quick despatch in the River Tyne. Price and other terms on application at the

FITTING OFFICE, NEWCASTLE-ON-TYNE.

## HOLMSIDE GAS COALS.

*South Metropolitan Gaslight and Coke Company, 589, Old Kent Road, London, S.E., Oct.* 9, 1873.

At the request of Mr. Hedley, the owner of the Holmside Colliery, I have much pleasure in stating that, for about ten or twelve years past, this Company has taken at least half of its supply of Newcastle Coal from him. I can, therefore, confidently bear testimony to the good quality of the Holmside Coals, and consider they are equal to the best of the Newcastle Coals, in proof of which I may state that this year we are using those Coals exclusively, that the yield of Gas is from 9700 to 9800 feet per ton, and that the quality of the Gas, without any admixture of Cannel, is over 16 candles, as tested by the officer appointed by the Metropolitan Board of Works, using the London Gas Referees test.

The Coke is of excellent quality, and in quantity amounts to about 40 bushels from a ton of Coal.

The annual consumption of Coal amounts to about 75,000 tons.

GEORGE LIVESEY, Engineer and Secretary.

P.S.—I am at this date, Feb. 15, 1875, still using Holmside Coals as largely as ever, and am quite as well pleased with them as when I gave the above certificate.

GEORGE LIVESEY.

We are this year, 1878, using 80,000 tons of Holmside Coal. GEORGE LIVESEY.

FITTING OFFICE:

Address, 75, QUAYSIDE, NEWCASTLE-ON-TYNE.

## M. BREMOND'S NAPHTHALINE PROCESS.

A negotiations respecting M. Brémond's patented process for preventing Deposits of

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in Gas Main and Service Pipes should be addressed to Mr. W. H. BENNETT, 22, Great George Street, WESTMINSTER, S.W., or to M. BREMOND, Gas Engineer, Compania Madrilena de Alumbrado y Calefaccion por Gas, MADRID, who may be consulted upon all matters connected with the Gas Industry.

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## THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

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## NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

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PATENTEE and MANUFACTURER of the following Invention

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

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## J. & J. BRADDOCK,

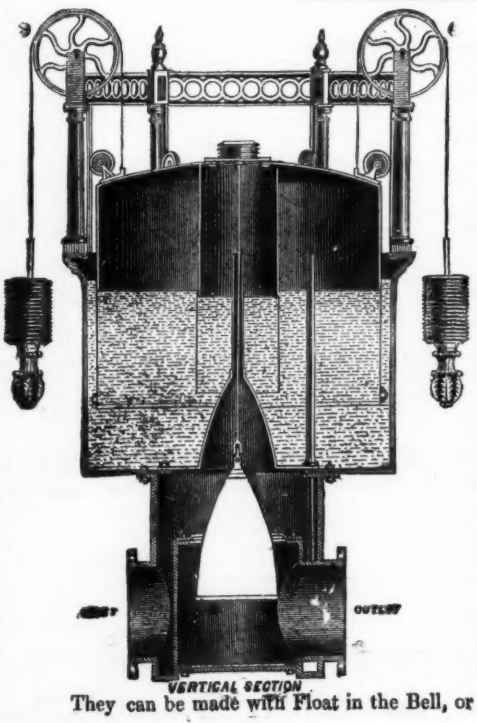
## GLOBE METER-WORKS,

## OLDHAM,

Beg to submit to Gas Engineers their

## PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.




The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 24-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

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BENJAMIN WHITWORTH, Esq., M.P. . . . . Chairman.
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## REAL OLD SILKSTONE GAS COAL.

**JAMES PATERSON Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—**

"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12,240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

**PRICES QUOTED TO ANY RAILWAY STATION, OR F.O.B. HULL, GRIMSBY, GOOLE, KEADBY, LIVERPOOL, AND FLEETWOOD.**

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For their Various Exhibits, amongst which is a

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SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owingto their compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

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S. C. & SONS undertake the entire erection of New, or Remodelling of existing Gas-Works in any part of the World, including small Works for MANSIONS, FACTORIES, &c., or Works of the largest extent (are now constructing the largest Gasholder yet erected); also the supplying and laying of MAINS.

They make a speciality of supplying every requisite whatever for Gas-Works, keeping in Stock what are most in request. WOOD SIEVES for Purifiers and Scrubbers, of a superior make.

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DESCRIPTION OF MORRIS & CUTLER'S PATENT CONDENSER.—The Condenser may consist of pipes arranged in tiers, or in any other form most convenient to the site available, each tier being connected with special connections, and containing within same either one or more coils of smaller pipe through which water is passed, being supplied from any convenient source of supply, the water passing in an opposite direction to the gas, so that the coldest water is at the gas outlet. The power of the Condenser can be regulated precisely in proportion to the quantity of water allowed to pass through, which is not in any way contaminated, but simply heated by the hot gas, and advantage can be taken of its being at a high level to carry it to a high-level cistern, from whence it can be used for supply to boiler or any other purpose. The Condenser itself may form the support for a high-level cistern. By an arrangement of valves the water may be shut off, and an air orifice opened, when air will pass through instead of water, or both air and water can be shut off. The power of the Condenser is, therefore, entirely under control. The Condenser may be seen in operation at the Brentford Gas-Works.

**For further Particulars, apply to Mr. F. MORRIS, GAS-WORKS, BRENTFORD, or to S. CUTLER & SONS, PROVIDENCE WORKS, MILLWALL (Near the Steamboat Pier), LONDON, E.**

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# NEWTON, CHAMBERS, & CO.,

## THORNCLIFFE IRON-WORKS AND COLLIERIES,

NEAR SHEFFIELD.

## CELEBRATED SILKSTONE GAS COALS.

**The various descriptions of Gas Coal produced from the above Collieries possess an unequalled reputation, combining in a large degree the constituents essential for the production of the best quality of Coke and Gas of a high illuminating power.**

**A recent extensive development of the Collieries enables us to offer increased supplies.**

**JAS. PATERSON, Esq., of Warrington, after testing various qualities of our Coal, has sent the following testimony of their merits:—**

"*Warrington Gaslight and Coke Company,*
*Offices, Mersey Street, Warrington, April* 23, 1877.

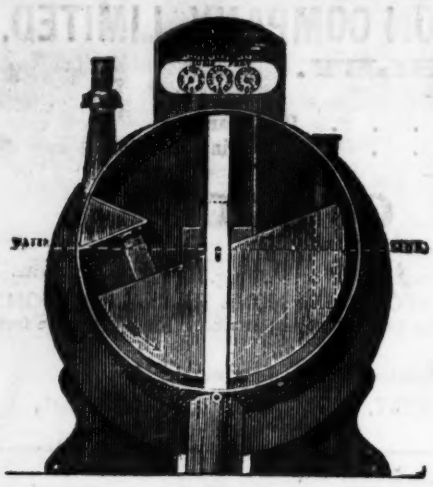
"MESSRS. NEWTON, CHAMBERS, AND CO.,

"GENTLEMEN,—After carefully testing the various samples of Gas Coals sent from your Collieries for analysis, I have pleasure in reporting them as belonging to the highest class of Gas and Coking Coals.

"The average of Nine samples gives a yield of **12,500** cubic feet of **15½**-Candle Gas, being equivalent to **664** lbs. of sperm per ton, and **1420** lbs. of fixed carbon of a very superior quality. All the samples bear a close relation to each other in value.

"Yours truly, "JAMES PATERSON."

**Full particulars will be sent on application to us—address as above.**



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Over 120,000 in action.

MANUFACTURERS:

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## ALEXANDER WRIGHT & CO.,

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STATION-METERS, AND GOVERNORS.

METERS, BOXES, REGULATORS, AND ALL REQUISITES FOR PUBLIC LIGHTING.

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THE UNVARYING WATER-LINE GAS-METERS,

IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;

STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;

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## IMPROVED HYDRAULIC CRANES,

Effecting a great saving in the cost of discharging Coals from Vessels, Barges, &c. Several of these Cranes, with the necessary power, are now being erected at the Beckton Gas-Works.

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For LIFTING RAILWAY WAGGONS to RETORT-HOUSE STAGEWAY; CAPSTANS for HAULING WAGGONS, &c.,

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Sixteen recently erected at Beckton, applied to Covers 30 feet square.

GAS AND WATER PIPES, ROOFING, BOILERS, &c.

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